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CSIR NEWS

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C.F.T.R.I., MYSONE

CSIR REORGANIZED

The Society of the Council of Scientific and Industrial Research (CSIR) at its meeting held on 23 November 1977, with the Prime Minister in the chair, decided to reorganize CSIR with a view to establishing stronger linkages between the research laboratories and the users of research results. Four laboratories, three museums and 10 cooperative research associations will be attached to concerned user ministries/departments.

The list of laboratories, museums and associations and the ministries/departments to which they will be attached is as follows :

Ministry of Works and Housing: Central Building Research Institute, Roorkee.

Ministry of Shipping and Transport: Central Road Research Institute, New Delhi.

Ministry of Petroleum: Indian Institute of Petroleum, Dehra Dun.

Ministry of Energy: Central Fuel Research Institute, Dhanbad.

Ministry of Education: Birla Industrial & Technological Museum, Calcutta; Visvesvaraya Industrial & Technological Museum, Bangalore; and Nehru Science Centre, Bombay.

Ministry of Industry: Ahmedabad Textile Industry's Research Association, Ahmedabad; Bombay Textile Research Association, Bombay; Silk & Art Silk Mills' Research Association, Bombay; South India Textile Research Association, Coimbatore; Wool Research Association, Bombay; Indian Jute Industries' Research Association, Calcutta; Automotive Research Asso-

ciation of India, Poona; Indian Plywood Industries Research Institute, Bangalore; Cement Research Institute of India, New Delhi; and Indian Rubber Manufacturers' Research Association, Bombay.

The units to be transferred will, however, continue to function as autonomous bodies. Each of them will be registered as a separate society with the concerned minister as its chairman. They will also be required to send periodic reports to CSIR.

The remaining laboratories and research associations will continue as at present under CSIR.

Commonwealth Scientists Discuss Regional Collaboration in Metrology

In view of the increasing trade between various countries in the world it is necessary that the national metrological systems of different countries are coupled together so that a product made against a certain specification of one country can meet the requirements of other countries, thereby promoting international trade. The coupling of the various national metrological systems is obtained through intercomparison of national standards for physical measurements of different countries among themselves.

Realizing the importance of testing and calibration in the economic development of developing countries, which in turn will promote trade amongst themselves, the Commonwealth Science Council (CSC) organized a Project Group Meeting for Regional Collaboration of the Commonwealth Coun-

tries in Asia and the Pacific Region. This meeting took place at the National Physical Laboratory (NPL), New Delhi, from 21 November to 2 December 1977 and was attended by about 50 scientists from many Commonwealth countries. Incidentally this was the first meeting of its kind held in the region to evolve a common programme for sharing testing and calibration facilities, intercomparison of measurement standards, exchange of information and trade, and to evolve a joint development programme.

The meeting was jointly organized by NPL and CSC. Apart from the Commonwealth countries in the region, viz. Bangladesh, Hong Kong, India, Malaysia, New Zealand, Papua New Guinea, Singapore, and Sri Lanka, delegates from Britain and Unesco also took part. The meeting was jointly financed by the Government of India, Commonwealth Fund for Technical Cooperation and CSC.

The meeting brought together for the first time scientists engaged in testing and calibration, and maintenance of standards of physical measurements in different countries in the Commonwealth. It also provided a facility for the exchange of views on the calibration procedures, testing methods, etc. Some of the specific projects identified at the meeting were : (1) Study and evaluation of the existing calibration procedures in each country; (2) Intercomparison and calibration of the existing standards of mass, length, force and various electrical and electronic parameters; (3) Advice and assistance on the establishment of specific measurement standards and calibration

facilities in member countries where these do not exist; (4) Supply of measurement standards and calibration equipment; (5) Compilation of a directory of measurement standards and calibration facilities in the region; and (6) Harmonization of testing and calibration procedures in the region.

In order to follow up the decisions made at this meeting, a regional group consisting of participants from each of the countries in the region has been constituted. This group will periodically meet and take an overview of collaboration between the various countries in this very vital field. In addition, a small steering committee comprising representatives from India, Malaysia and New Zealand has been constituted. The steering committee will serve as an advisory body to CSC for implementing the programmes evolved by the regional group. It is envisaged that the work on the joint projects which have been identified in the meeting will be undertaken shortly and it is hoped that the progress made in these projects will be reported at the 10th meeting of CSC to be held at Georgetown in September 1978. The second meeting of this group is scheduled to be held in March 1979.

The present project group meeting forms a part of the CSC's coordinated R & D programme which envisages intercountry collaboration in a few selected fields such as standards, rural technology, natural products, alternative energy resources, industrial research and training, and research management and administration.

Symposium on Archaean Geochemistry

An international symposium on Archaean Geochemistry was organized at Hyderabad from 15 to 19 November 1977 coinciding with the annual meeting of the International Working Group on Archaean Geochemistry. The symposium was jointly sponsored by International Geological Correlation Program (IGCP) of Unesco; Geological Survey of India (GSI);

Atomic Minerals Division (AMD) of the Department of Atomic Energy and the National Geophysical Research Institute (NGRI), Hyderabad. The main purpose of the symposium was to understand the evolution of the Archaean crust, which evolved more than 2500 million years ago. Its geochemistry has not been fully studied and India is one of the few countries where these rocks are well exposed for scientific study.

Unesco-sponsored IGCP has started a project (1974) on Archaean geochemistry with a view to pooling the international know-how and equipment to know the formative processes of the earth, controls of its evolution and localized mineral wealth in certain places. These processes have been responsible for bringing up the mineral resources to the economically exploitable depths within the earth's top crust. Therefore, the study of Archaean rocks, especially their chemistry, is one of the most significant aspects of the earth sciences today. The Archaean geochemistry has attracted the attention of scholars to prepare theoretical models and concepts for the evaluation of the earth's crust. In a developing country like India, it has a special significance in that fundamental research work could be matched with the practical applications of mineral exploration.

Prof. C. S. Pichamuthu, President of the Geological Society of India, in his inaugural address stressed that basic work like geological and structural mapping should be given priority. He pleaded for the early setting up of at least one central laboratory equipped with advanced equipment necessary for this work so that it could be utilized by interested workers in government organizations and universities.

Earlier, Shri V. K. S. Varadan, Director General of GSI and Chairman of Indian National Committee of IGCP, in his presidential address, pointed out that the results obtained from the programme were likely to be important not only in increasing the scientific knowledge of geochemistry of

the Archaean, but might be expected to assist in the exploration of mineral resources.

Dr Hari Narain, Director of NGRI and chairman of the local reception committee, explained the many unique geological and geophysical features of the Indian sub-continent. He pointed out that from detailed geochemical studies, NGRI succeeded in demarcating certain areas of high copper concentration in the state of Karnataka, which had direct bearing on the mineral exploration programmes of the country.

NGRI brought out a special issue of its bulletin on its contributions to Archaean geochemistry, presenting a picture of the detailed studies carried out by the geochemistry group over the last 10-12 years and plans for future collaborative programmes.

Besides Indian delegates, drawn from eight universities and various organizations, scientists from USA, USSR, Germany, France, Canada and Nigeria participated in the deliberations spread over six technical sections. In all, 60 papers were presented and discussed. The results of the work jointly carried out by NGRI, GSI and AMD were presented. The symposium provided an excellent opportunity for the geoscientists belonging to different schools of thought to meet and exchange data obtained by using different types of instruments.

After the inaugural function, Dr G. N. Hanson, Secretary of IGCP, opened an exhibition organized in connection with the symposium. GSI, AMD, NGRI, Kudremukh Iron Ore Project, Electronics Corporation of India Ltd, Philips India Ltd, and other organizations exhibited a wide range of geological maps, geophysical maps, geological samples and electronic instruments.

On the concluding day a panel discussion was arranged under the chairmanship of Dr B. P. Radhakrishna. Some selected Indian and foreign scientists took part in these discussions. The proceedings of the symposium

will be published by Elsevier Publishing Co.

Workshop on Liquid Chromatography

A workshop on liquid chromatography was held at the Central Drug Research Institute (CDRI), Lucknow, from 7 to 10 December 1977 to provide training in the application and use of high polymer liquid chromatography. It was sponsored by the Department of Science and Technology through the Regional Sophisticated Instruments Centre at CDRI, Lucknow, jointly with Materials Research Instruments, Bombay, and Waters Associates, Boston, USA.

The first two days of the workshop were devoted to the theoretical aspects of liquid chromatography—general theory, solvents and samples, liquid-liquid and liquid-solid chromatography, gradient and recycle operations, size separation, column packing, and maintenance and method development. On the third day, in the morning session there was a practical demonstration of the operation of the apparatus and in the afternoon there was a seminar on 'Therapeutic drug monitoring by liquid chromatography' followed by a talk by Dr Ashok Misra of IIT, Delhi, on the 'Use of liquid chromatography in high polymers'. The last day was also devoted to practicals followed by a general discussion and a quiz session on the course.

The course was attended by 39 delegates from universities, IITs, Defence Science Laboratories, industry, national laboratories and other institutions. The course was conducted by Mr Lou Franconi of Waters Associates, USA.

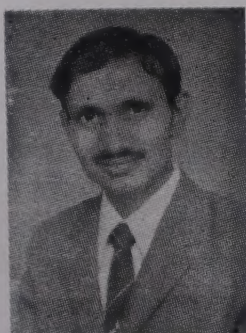
Refresher Courses in Fuel Technology

Two ten-day training courses in important aspects of fuel science and engineering were held at the Central Fuel Research Institute (CFRI), Dhanbad, in collaboration with the Institute of Fuel, London (Indian Section, Calcutta).

The two courses were on coal sampling and analysis (6 to 17 September 1977) and coal combustion (19 September to 1 October 1977). The training was imparted through theory classes and practical demonstrations including visits to experimental plants wherein operation and maintenance were explained to the participants. Lectures in both the courses were delivered by CFRI scientists and specialists invited from outside organizations.

INSA Award to Dr V.R. Singh

Dr Ved Ram Singh of the National Physical Laboratory (NPL), New Delhi, has been awarded the 1977 'Science Academy Award for Young Scientist'



of the Indian National Science Academy (INSA), New Delhi, for his work on semiconductor strain gauge transducers. The award, comprising a medal and Rs 5000 in cash, is given annually to a

young scientist below the age of 30 years in recognition of his outstanding work.

Semiconductor strain gauges which have been developed recently by Singh and his coworkers at NPL are more sensitive, say by a factor of 100, than the older resistance wire strain gauges. These new gauges have been used for developing various transducers for measuring non-electrical parameters for industrial, medical, engineering, scientific and other applications. The transducers developed are highly sensitive, cheap and light-weight. All the parts have been fabricated using indigenous materials. The cost of an indigenous transducer is expected to be about one-tenth of that of the imported unit.

Industrial transducers have been made for the measurement of high and low pressures, column heights, immersion depths, large and small flow rates of all types of fluids, small and big weights and small displacements, and

for level determination. Various biomedical transducers (e.g. blood and other physiological pressures, breathing rate, pulse rate, jaw force, urinary flow, and medical drip and blood flow transducers) have also been designed and developed and these transducers find a host of applications in medicine, physiology, neurophysiology, surgery, biophysics, biochemistry, and aeromedical and other medical diagnostics.

The technique of measuring small displacements, as cited above, has been further utilized for a number of engineering and scientific investigations. High voltage of high source impedance has been measured by the transducer technique, which is further used to achieve an ac/dc transfer standard. Dimensional changes of quartz crystals under the electric fields have been measured; this becomes a useful technique to test the quality of raw uncut quartz crystals before making crystal resonators from them. The dimensional change monitored under magnetic and electric fields in ferromagnetic and ferroelectric materials has also enabled the development of better acoustic transducers.

It is expected that this new development will not only lead to self-sufficiency and saving of foreign exchange, but also open new lines of research in science and technology.

The award was given away on 15 October 1977.

Vacuum Guard : IIP

The Indian Institute of Petroleum (IIP), Dehra Dun, has designed and developed a vacuum guard which will guard the vacuum in system working under reduced pressure by instantaneously isolating the system in case of emergency. Whenever there is a sudden rupture in the vacuum line or a breakage in the weaker parts of the assembly, the vacuum guard will prevent atmospheric air from rushing inside. The device has been primarily designed to act as a safety valve in vacuum distillation units handling petroleum and its products, which are prone to fire or explosion in case the hydrocar-

Heat Transfer Coefficient in Turbine Cascades

The National Aeronautical Laboratory (NAL), Bangalore, has developed an experimental technique for the determination of the distribution of convective heat transfer coefficients around turbine blades. A knowledge of this distribution is important in the design of internally cooled and film-cooled turbine blades. The technique developed envisages fabrication of an instrumented blade from a thin sheet (0.25 mm) of stainless steel clad over an Araldite former. A number of fine wire thermocouples are fixed on the inside of the sheet in the mid-span region. The sheet is heated with a high current ac source so as to provide a known uniform heat flux on the blade surface. The local heat transfer coefficients are determined from the measured surface to free-stream temperature differences and heat flux. The relatively high thermal resistance of the sheet ensures that errors owing to surface conduction of heat are small (less than 5% over the major portion of the surface) and can be readily estimated.

The technique can now be used to evaluate any given design of blade and cascade geometry over a representative range of Mach number (M_{exit} up to 0.8) and Reynolds number (Re up to 3.9×10^5 per cm). Tests are presently being carried out for a typical high

pressure turbine rotor blade. The results are useful in the evaluation of blade surface temperatures under operating conditions and for validation of theoretical methods for prediction of surface boundary layers.

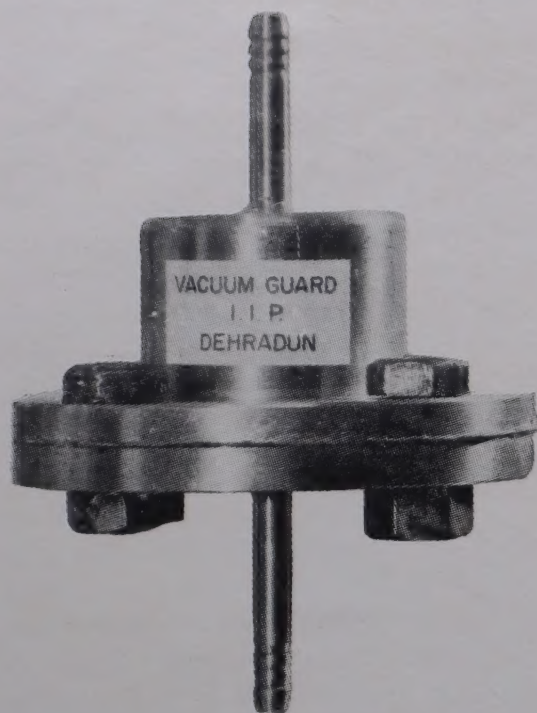
Since the theoretical methods are unreliable in predicting the transition, the experimental technique forms an essential tool to obtain design data.

Titanium Substrate Insoluble Anode : Economics of Use

The economics of the use of the titanium substrate insoluble anodes (TSIA) developed by the Central Electrochemical Research Institute (CECRI), Karaikudi, as a substitute for graphite anodes used largely in chlor-alkali industry, have been worked out.

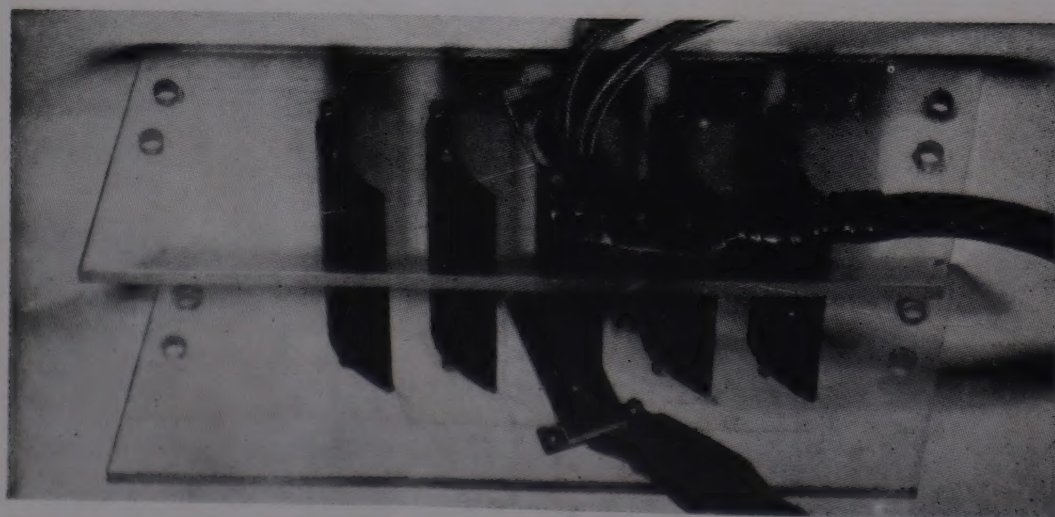
The cost of production of caustic soda is expected to come down by Rs 30 to 100 per tonne (depending upon the cell size and plant capacity) if the chlor-alkali industry switches over to TSIA. Considerable saving in electrical energy consumption and uninterrupted cell runs are the major advantages obtainable by this change-over. TSIA can be reactivated and reused a number of times. These anodes have potentialities for other industrial applications also.

To make these anodes commercially viable they were evaluated in commercial diaphragm and mercury type cells. It was seen that under identical conditions, operating voltage obtained with graphite electrode was 3.9 V in diaphragm type cell (capacity, 1200 A), while the operating voltage obtained with TSIA in the same type of cell was 3.5 V, with a voltage advantage of 0.4 (10%). This type of cell has been installed at DCM Chemical Works, New Delhi. The corresponding data for mercury cell (capacity, 20 kA) are 4.4 V and 3.9 V with a voltage advantage of 0.5 (12.5%) (Hindustan Heavy Chemicals, Calcutta), and those for diaphragm type cell (capacity, 33 kA) are 3.95 V and 3.3 V respectively with a voltage advantage of 0.65 (17%) (Ballarpur Paper Mills, Ballarpur).



Vacuum guard developed at IIP, Dehra Dun

bons at high temperature come in contact with atmospheric air owing to any leakage or breakage. A special feature of the device is that it provides a two-directional pressure equalizing or sensing link between the two sides of a valve seat under normal conditions of operation and yet is capable of isolating the system in case of rupture. This is an advantage over the presently used valves which are essentially unidirectional flow maintenance devices. The device is likely to find applications in various other systems, such as railway brakes, where vacuum has to be maintained for technical reasons.



Turbine cascade for heat transfer studies developed at NAL, Bangalore

One of the inventors of this anode has started an industry for the production of TSIA, under the scientist-entrepreneur scheme. This firm (Titanium Equipment & Anode Manufacturing Co. Ltd, Madras) has commenced production, and has so far received orders from four leading chlor-alkali manufacturers in India.

This invention received the 1977 Independence Day award of the National Research Development Corporation of India, New Delhi.

New Experimental Coke Plant at CFRI

A novel byproduct recovery convertible experimental coke oven has been designed, developed and installed at the Central Fuel Research Institute (CFRI), Dhanbad. Successful trial runs have already been completed.

The designing of the new oil-fired experimental coke oven was taken up when the earlier test plant designed and installed by a West German firm in 1957 became unserviceable in 1975. An indigenously designed test plant was installed at CFRI. The features of the design are (i) steady flue temperature,

(ii) uniform carbonizing condition, (iii) flexibility in operation, and (iv) easy maintenance. The refractories were so selected as to withstand repeated heating and cooling as per the new schedule of operation. The new experimental coke oven is designed for furnace oil firing and has a coal charging capacity of 1100 kg/batch. The oven can be heated to operational temperature within three days.

New Ternary Semiconductors

Studies on the electrical, optical and structural properties of some mixed thiogallate ternary semiconductors, viz. $\text{CdGa}_2\text{S}_4(1-x)\text{Se}_{4x}$, where $x=0.0, 0.25, 0.50, 0.75$ and 1.00 , have been made at the National Chemical Laboratory, (NCL), Poona, by Shri S. T. Kshirsagar under the guidance of Dr A. P. B. Sinha. Interest in these materials is generated by their defect chalcopyrite structure ($1\bar{4}$) which could make them useful for second harmonic generation and photoelectric applications.

These compositions were prepared by the usual compound semiconductor techniques. Debye-Scherrer X-ray diffraction patterns confirmed their

tetragonal defect chalcopyrite structure with space group $1\bar{4}$. Single crystals were grown of these compositions by chemical transport method. The crystals of CdGa_2S_4 and $\text{CdGa}_2\text{S}_3\text{Se}$ had the biggest face parallel to (001) plane whereas the crystals of $\text{CdGa}_2\text{S}_2\text{Se}_2$, $\text{CdGa}_2\text{SSe}_3$ and CdGa_2Se_4 were triangular prisms with a face parallel to (112) plane and $\langle 110 \rangle$ as their growth axis. The selenium positions in CdGa_2Se_4 were obtained by comparing the calculated values of structure factors with those obtained from observed intensities.

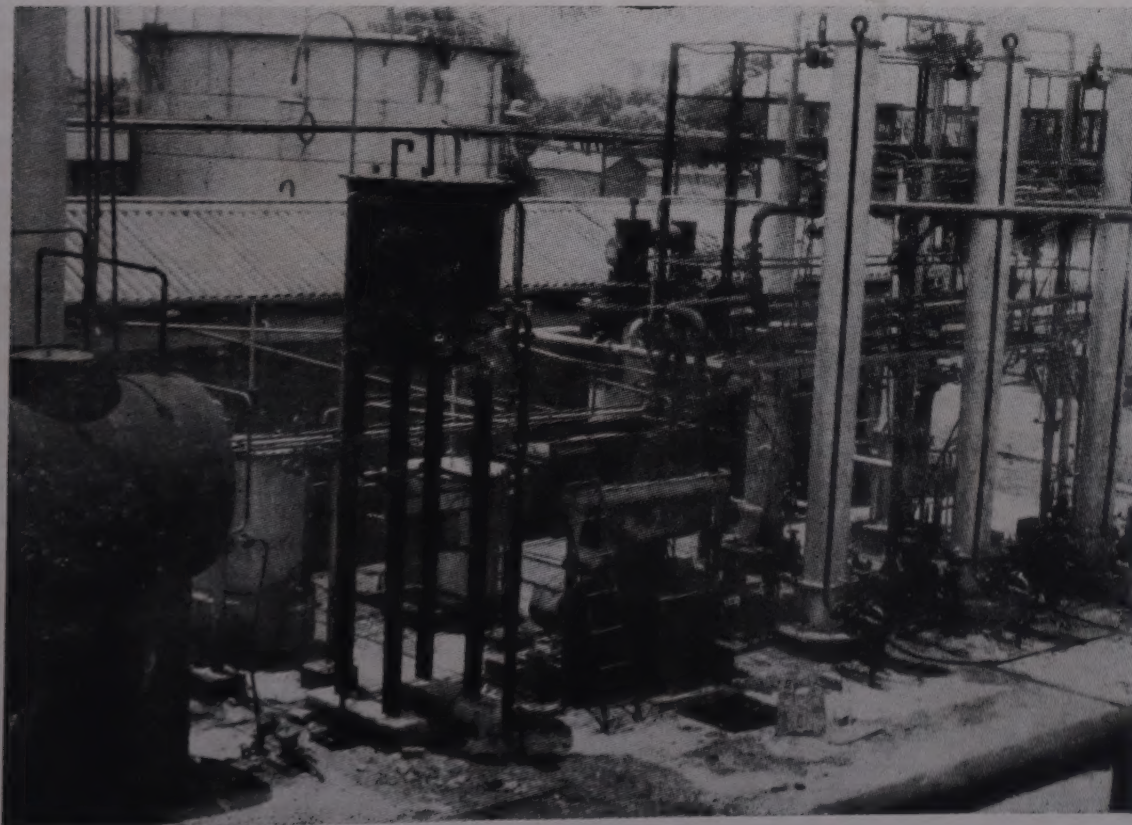
The optical absorption spectra revealed that the fundamental absorption edge varies with composition from 2.3 eV to 3.25 eV and that these compounds were direct band gap materials.

All the compositions exhibited photoconductivity in the visible range of the spectrum. The ratio of dark resistivity to light resistivity was of the order of 10^5 . The energy gaps deduced from spectral response of photoconductivity measurements were found to be in agreement with those deduced from optical absorption curves.

In spite of their large band gaps, these compounds exhibited intrinsic semiconduction above 250°C . All samples were n-type and had a constant thermoelectric power $\sim 300 \mu\text{V}/^\circ\text{C}$ in the temperature range $250\text{--}350^\circ\text{C}$.

Thin films of the compounds CdGa_2S_4 and CdGa_2Se_4 were prepared by vacuum evaporation and flash evaporation methods. Electron diffraction studies showed that these films generally had the same crystal structure as that of the bulk, but sometimes they underwent a phase change depending upon the depositing conditions. Analysis of the optical absorption spectra of these thin films indicated a close agreement with that of the bulk and yielded 2.51 eV and 3.50 eV as values of the energy gaps for direct transitions in CdGa_2Se_4 and CdGa_2S_4 respectively.

Shri Kshirsagar has been awarded a Ph. D. degree by the University of Poona in August 1977 for his thesis based on these studies.



The oil service tank with the byproduct recovery unit at CFRI, Dhanbad

Deputation Briefs

Prof. Dinesh Mohan, Director, Central Building Research Institute (CBRI), Roorkee, visited UK, on deputation, from 1 to 22 September 1977 under the British Council's visitors programme. During the first week he visited the Building Research Station at Watford, the Fire Research Station at Borehamwood, and the Scottish Branch of the Building Research Station at Glasgow. All these three stations are under the Building Research Establishment, Department of Environment, UK. These visits enabled him to familiarize himself with some of the major research projects which were of interest to India. He also spent a day at the Department of Education and Science and discussed the work carried out in UK on primary school buildings. He was also invited to attend a meeting of the Building Materials Panel of the Intermediate Technology Development Group based in London where he delivered a lecture highlighting CBRI's work on building research. The second part of his visit was devoted to attending the conference of directors of English-speaking building research organizations (10-12 Sep.) at Fife and the seventh congress of the International Council of Building Research Studies and Documentation (CIB) at Edinburgh (14-21 Sep.).

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Dr L. V. Venkataraman of the Central Food Technological Research Institute (CFTRI), Mysore, visited on invitation by the Federal Republic of Germany on behalf of the German Agency for Technical Cooperation (GTZ), different institutes in Germany dealing with biology, mass production and testing of microalgae and to meet the various German scientists working in the field of algal technology and physiology. The visit, lasting from 13 October to 2 November 1977, also included participation in the Microalgae Workshop held at München on 17-18 October.

A pilot plant for algal production has been set up at CFTRI under an Indo-German agreement. The project

is aimed at utilizing algae as a source of single cell protein as supplementary protein. Since the completion of the agreement in August 1976, the project is being run by CFTRI. The visit was a part of the agreement which provided for visits by Indian scientists to West Germany to know the recent development in algal production.

The microalgae workshop at München included papers and discussion on the following aspects of algal production: cultivation of algae in clean and sewage waters; methods of processing; contamination problems; evaluation as feed for cattle and clinical trials; and toxicological aspects. Scientists from Germany, Israel, Thailand, Peru and India participated. The workshop focussed the attention on the potentiality of using sewage effluents for algal production for use as cattle feed.

Following the München workshop, Dr Venkataraman visited Institut für Chemische pflanzen physiologie of Universität Tübingen and met several scientists working on different aspects of algae, such as heavy metal

accumulation by algae and use of algae for monitoring atmospheric pollution, removal of uranium from sea-water and also the toxic and nontoxic exudates of algae. He visited Pflanzen physiologisches Institut, Institut für Microbiologie, and Forst botanisches Institut, all of the University of Göttingen, and familiarized himself with work in progress on the basic and applied aspects of algae.

At Dortmund, he visited the Max Planck Institut and learnt the procedures for clinical evaluation and testing of algae. At Abteilung für Algenforschung und Algentechnologie, he familiarized himself with different aspects of algae which included mass cultivation, chemical, pharmacological aspects, microbiological assay, nutritional evaluation, etc. Cultivation of algae on pig fertilizer and heavy metal monitoring in the algae and methods of lowering the same are receiving attention. He returned to India after a final round of discussions at GTZ, Eschborn, on the experiences gained in Germany on algal technology.

CSIR SUPPORT TO RESEARCH

New Schemes

Laser Interferometry for Stress Analysis of Structural Elements

Laser interferometric techniques for stress analysis offer several advantages over conventional techniques and are being rapidly developed in advanced countries. Development of these techniques in India is still in an initial stage. These techniques can be very successfully employed for structural analysis of nuclear reactors, spacecraft and other important structures. Prof. P. R. Rao of the Physics Department and Prof. M. Paldas of the Civil Engineering Department at the Delhi College of Engineering, Delhi, propose, under a new CSIR scheme granted to them, to develop these techniques for the successful analysis of stresses in structural elements.

The techniques would be developed by employing laser interferometry for the stress analysis of the structural elements, and using a suitable transparent model and a Fabry-Perot interferometric set-up. Using this set-up, solutions to several problems under conditions of static loading will be investigated. If possible, the work would be extended to the problems involving dynamic loading.

The problem of disc in diametral compression has already been dealt with and stresses have been determined successfully. However, before considering the problems of dynamic loading, the following experiments on a number of statically loaded models would be conducted for gaining a clear understanding of the nature of the two fringe families corresponding to the two principal stresses: (i) simply supported beam under four-point loading, (ii) cantilever loaded at the free end, (iii) tapered

cantilever loaded at the free end, (iv) ring under diametral compression, and (v) castellated beam under four-point loading.

The results thus obtained experimentally would be compared with the analytical solutions. This will help in studying the merits and limitations, if any, of the methods attempted.

Attempts would also be made to develop a reflection holographic set-up so that full-field deflection studies could be performed for plate-like structures on a real-time basis. This would require recording of a successful hologram of the plate-like structure under a 'no-load' condition. The real-time interferograms obtained after statically loading the plate would be analyzed to derive full-field information regarding the plate deflections.

Post-Harvest Physiology of Some Ornamental Flowers

There is little fundamental understanding of the senescence of flowers grown

and used in India. As such, development of the techniques of prolonging the freshness of cut blooms would be of great commercial value. Under a new CSIR scheme sanctioned to Prof. H. Y. Mohan Ram of the Department of Botany, University of Delhi, investigations will be carried out on chrysanthemum, marigold and rose to understand the nature of flower senescence and to develop efficient and inexpensive methods for increasing the longevity of cut flowers. The keeping quality of these flowers would be studied through pre- and post-harvest treatments. In addition to studying the water balance and vascular blockage of flowers under chemical treatment, histological and metabolic changes accompanying flower senescence would be taken up.

Prof. Mohan Ram's group has so far been engaged in studying flower senescence of gladioli, lupin, jasmine and chrysanthemum. The group has evolved methods by which the shelf-life of these flowers can be profitably prolonged.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Optical System of Facsimile Terminal Equipment

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has developed an optical system of facsimile terminal equipment comprising a well corrected triplet scanning objective of relative aperture $f/2.1$ and focal length 11.8 mm and a doublet condenser. The system developed is a critical item in the transmitter part of the facsimile terminal equipment. The facsimile equipment has varied applications, e.g. telegram pick-up and delivery; transmission of business documents, meteorological data, cloud cover photographs, rail-roadway bills, X-ray photographs to radiological interpretation centres, etc.; and recording of graphic data from signals sent

by orbiting and stationary satellites. Facsimile can also be of much aid in information storage and retrieval work since it provides rapid remote access to documents stored on microfilms.

CSIO has designed the lens system by adopting the optimum design procedures based on aberration coefficients of the higher orders and minimizing the total image displacements by using the electronic computer. The performance was theoretically predicted with reference to established quality control performance criteria as per the requirements. The optimum values were obtained and prototypes were fabricated. Evaluation tests carried out, both in the laboratory and under actual field conditions, were found to conform to specifications. The product developed has been tested and found completely accepta-

ble by a firm engaged in developing facsimile terminal equipment. The designs developed are based on optical glasses manufactured indigenously by the Central Glass and Ceramic Research Institute, Calcutta.

The manufacturing process consists of the following steps: procurement of optical glass blanks, metals for mounts and other raw materials; fabrication of lenses in optical workshops as per design data followed by antireflection coating; fabrication of mechanical components as per drawings; checking of optical and mechanical components; assembly of lenses in dust-free room; and performance evaluation.

The demand for this equipment is expected to be about 500 units per annum in 2-3 years' time. The facsimile terminal equipment are being imported at present. The c.i.f. value of an equivalent imported system is about Rs 500.

The raw materials used in the process are optical glass, non-ferrous metals, etc. All the raw materials are available indigenously.

In view of the relatively low turnover, it is recommended that the project be taken up by those firms which are already engaged in the manufacture of precision optics.

It is suggested that a unit producing 100 pieces of this device per annum would be an economic one. Such a unit would require Rs 9000 as working capital. The cost of production and the selling price per device are estimated at Rs 350 and Rs 450 respectively.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PERSONNEL NEWS

Appointments/Promotions

Shri V.R. Sista

Shri V.R. Sista of the Indian Institute of Petroleum (IIP), Dehra Dun, has been appointed, on promotion, Scientist E with effect from 24 November 1977.

Shri Sista (born 11 August 1938) obtained B.Sc. Hons (1959) and M.Sc.

(1960) in physical chemistry from the Andhra University. In 1961, he obtained M. Tech. in applied chemistry from the Indian Institute of Technology, Kharagpur.

After a short stay at the Oil & Natural Gas Commission, he joined IIP in August 1962. He played a pivotal role in setting up 'Separation Processes Laboratory' in the institute. From August 1964 to November 1965, he visited Institut Francais du Petrol (IFP), Paris, to acquaint himself with the techniques of separation of hydrocarbons and their utilization. On his return from IFP, he was engaged in the development of a process for the production of single cell proteins (SCP) from hydrocarbons on a laboratory scale fermentor. Subsequently, a pilot plant was set up at Gujarat Refinery premises in 1969. In 1972, he visited IFP to get first-hand knowledge of hydrocarbon fermentation technology. He also visited IFP, France, and Holland to study the progress made in the field of production of single cell proteins, their acceptability tests and field trial experiments in 1976. The small pilot plant has now been replaced by a bigger plant capable of producing 50 kg of protein concentrate per day. Shri Sista has isolated a yeast from the Gujarat Refinery soil which has superior properties. This yeast does not require sterile conditions and is active even at highest medium temperatures of up to 37°-40°C. Shri Sista has to his credit 25 research reports and nine research papers.

Shri P. N. Bhambi

Shri P. N. Bhambi of IIP has been appointed, on promotion, Scientist E with effect from 24 November 1977. Shri Bhambi (born 28 April 1933) received his B. Sc. (mechanical engineering) degree from the Agra University in 1958. In 1959, he passed post-graduate diploma (applied thermodynamics) from the Roorkee University. After working as a Design Assistant for 21 months at the Research Designs

and Standards Organisation, Lucknow, he joined IIP as Senior Scientific Officer in 1962.

As a Project Engineer, he has been responsible for conducting techno-economic studies, product demand estimation, transportation of petroleum products, design of machines, LPG bottling units and material requirements for petroleum industries. Since 1967 he has been heading the group engaged in the research work in the field of applied combustion, where he has conducted extensive studies related to efficient utilization of domestic appliances.

In 1975, he visited West Germany under CSIR-German Academic Exchange programme. During this study tour he visited Institut fur Wärmetechnik; Institut fur chemi-technologie, Institut fur Tribologie, University-Clausthal Zellerfeld and Institut fur Erdolforschung Hanover, Pein Stahl Werke Salzgitter. During his short study tour in France, he visited the French Petroleum Institute, Paris, Institute for Polymer Combustion Orleans, Sopaluna, and Thermal Power Station, Porschiville.

In recognition of his outstanding contribution in the field of standardization, he was awarded fellowship of the Indian Standards Institution for the year 1977.

He has to his credit more than 45 publications and reports and six patents on industrial and domestic burners. He has also compiled and published a directory on 'Indigenous Equipments and Materials for Petroleum Refineries, Petrochemical Plants and Allied Industries'.

Transfers

Shri A. P. Jain has joined the Central Salt and Marine Chemicals Research Institute, Bhavnagar, as Accounts Officer on transfer from the CSIR Headquarters, New Delhi (24 Oct. 1977)

Honours

Dr L. K. Doraiswamy of the National Chemical Laboratory, Poona, deliver-

ed 'The Vice Chancellor Sir A. L. Mudaliar Endowment Lectures in Technology : 1975-76' on 28 and 29 November 1977 at the A. C. College of Technology, Madras. The topics of his series of four lectures were : Regimes of Control in Catalytic Reaction (Parts I & II), and Advantages of a Basic Strategy for Process Design (Parts I & II).

IIP R & D Newsletter

The Indian Institute of Petroleum (IIP), Dehra Dun, has started publishing a quarterly house bulletin with the above title. The inaugural issue of the newsletter, brought out in November 1977, contains, among other news items, a brief history of the institute, its present objectives and activities and its major achievements. Enquiries in connection with the newsletter may be addressed to its editor Dr R. K. Srivastava, Indian Institute of Petroleum, Dehra Dun 248005.

Industrial Fermentation :

Symposium at RRL, Jammu

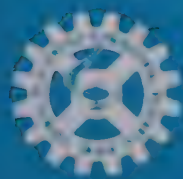
The Regional Research Laboratory (RRL) Jammu, will be holding a symposium on Industrial Fermentation from 4 to 6 March 1978. There will be six sessions devoted to organic acids, alcohols and organic solvents, pharmaceutical products (I & II), engineering aspects, and waste utilization.

Further details regarding the symposium can be had from : Dr C. L. Chopra, Secretary, Industrial Fermentation Symposium, Regional Research Laboratory, Jammu-Tawi 180001.

PATENTS FILED

222/Del/77 : An Improved process for the preparation of pure sodium or potassium silicate solutions from clay, M. C. Das & S. N. Dutta—RRL, Jorhat.

229/Del/77 : Improvements relating to the demineralization of coal by oil agglomeration technique, G.G. Sarkar, B. B. Konar & S. Sakha—CFRI, Dhanbad.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

World Mining Congress : Meeting of the Organizing Committee

The 41st meeting of the International Organizing Committee (IOC) of the World Mining Congress was organized by the Central Mining Research Station (CMRS), Dhanbad, in New Delhi from 6 to 16 November 1977. The Ministry of Energy, Ministry of Steel and Mines, and a number of other public and private sector units collaborated in the organization of the meeting. Twenty-six delegates from 13 countries, including the Peoples' Republic of China, took part in the meeting.

Shri P. Ramachandran, Union Minister of Energy, in his inaugural address, presented a brief analysis of the global energy situation and the Indian perspective, and highlighted the problem of choice of appropriate technologies in the social, economic and technical milieu of developing countries.

Shri Biju Patnaik, Minister of Steel and Mines, who was the chief guest, commended the organizing committee for providing a national forum for exchange of knowledge and experts in the exploitation of mineral resources throughout the world, and in aiding the process of development of technology which had a direct bearing on the national economic development. Referring to India's long tradition in mining and the mineral resources of India, Shri Patnaik urged the mining engineers to dwell upon the problem of mineral resources in backward areas through labour-intensive mining tech-

niques. He opined that proper evaluation, development and utilization of minerals called for a careful study and action by earth scientists and mining engineers.

The business meeting at New Delhi took major decisions on the organization of the next World Mining Congress at Istanbul to be held in 1979, incorporation of the World Mining Congress as a body of the United Nations, incorporation of other international organizations into the fold of World Mining Congress and the setting up of the Indian National Committee for World Mining Congress.

The meeting was a mini congress for the Indian mining community where the mining professionals had the privilege of hearing Dr Benon Stranz, Deputy Minister of Mining of Poland and chairman of the International Organizing Committee, Dr A. Dokukin, the USSR Academician, Prof. Fetteweis from Austria, Mr Norman Siddall, Deputy Chairman, National Coal Board (whose speech was read out), and Mr Wang Hsun, Deputy Director of the Ministry of Coal, Peking. The remarkable strides made by the Chinese coal industry were highlighted in Mr Hsun's lecture.

The members of the International Organizing Committee visited the Khetri copper mines, Sudamdih and Chasnalla coalmines, Usha group of factories at Calcutta and Ranchi, the Central Mining Research Station, etc. The Indian mining professionals were complimented for their technical competence and planning foresight by the visiting members of IOC.

CSIR Technology to Philippines

The know-how for the manufacture of paper boards for use in building and other construction works developed by the Regional Research Laboratory, Jorhat, in collaboration with the Central Building Research Institute, Roorkee, has been transferred to Benguet Electric Corporation of Philippines. The corporation signed an agreement with the National Research Development Corporation of India on 27 October 1977 for commercialization of the know-how on a lump sum payment basis.

The know-how utilizes wastes like street sweepings, straw and bagasse for the manufacture of cheap, durable, light-weight, fireproof and waterproof roofing sheets and other construction materials.

Award for CFTRI Scientists

The Rafi Ahmed Kidwai Memorial Prize for Agricultural Research for the biennium 1974-75 has been awarded jointly to Shri E. S. Nambudiri, Shri N. Krishnamurthy, Dr Y.S. Lewis, and Shri C.P. Natarajan of the Central Food Technological Research Institute (CFTRI), Mysore, and Dr A.G. Mathew, Head of the CFTRI Unit at Trivandrum, for their outstanding contributions in the field of food technology. These scientists have developed a technique for extracting the flavour of spices in natural state and concentrated form, keeping the residues of solvent used to less than 30 ppm, as required by the user countries.

So far, India has been exporting green pepper in cans or bottles for meat garnishing. As a result of the technique developed it is possible to export dry material which can be reconstituted, thus ensuring considerable saving in freight and manufacturing cost.

New methods have been developed for the quality evaluation and spice extracts such as determination of capsaicin in *Capsicum* and gingerol in ginger, and composition studies in volatile oils of pepper, ginger and cardamom by gas chromatography.

The efforts of the group have resulted in industrial application of these techniques.

The Union Minister of Agriculture & Irrigation, Shri Surjit Singh Barnala, who is also the President of the Indian Council of Agricultural Research (ICAR), presented the award at the annual general meeting of the ICAR Society on 8 December 1977.

High Pressure Technology Facility: NAL

A high pressure technology facility has been created at the National Aeronautical Laboratory (NAL), Bangalore, for studying the properties of materials under extreme conditions of pressure and temperature. Since its inception, several high pressure techniques and apparatus to attain higher pressures (100 kilobar) are being perfected. The high pressure laboratory is equipped with a 1000-tonne piston-cylinder apparatus. High pressures of the order of 50,000 atmospheres in a volume of approximately 0.3 cu. in. can be generated in this equipment. The specimens can also be simultaneously subjected to temperatures of the order of 1000°C. An opposed anvil high pressure system has recently been set up. This apparatus can be used to study the electrical resistance of samples as a function of pressure of up to 1,00,000 atmospheres. The following are the research facilities available in the laboratory:

Thermopower Analyzer : This is a new technique for the continuous and rapid measurement of thermopower of substances up to 50 kilobar and 1000°C. The technique utilizes operational amplifier circuitry and was entirely constructed in the laboratory. The overall accuracy of the instrument constructed out of this circuitry is within 1%. The performance of this system, checked in various studies on the thermoelectric behaviour of metals, alloys and semiconductors at high pressures and temperatures, has been successful.

Teflon Cell Technique : A teflon cell technique for the measurement of the absolute thermoelectric power of solids and liquid metals in the temperature range of 0-250°C and up to 40 kilobar pressure has been developed. The main features of this technique are: (i) generation of truly hydrostatic pressure on the sample; (ii) creation of a steady temperature gradient along the length of the sample; and (iii) easy adaptability to solids or liquid metals.

Resistograph : A novel technique has been developed in this laboratory for the continuous recording of resistivity as a function of temperature at high pressures using only four leads that come out of a high pressure cell. The main feature in this set-up is that the thermocouple wires act both as temperature sensors and as current and voltage leads. This system is of great use in high pressure experiments at elevated temperatures wherein it is impossible to take out more than four leads from the high pressure cell.

Dimethoate

Dimethoate, or O, O-dimethyl S-(N-methylcarbamoylmethyl) phosphorodithioate, is an excellent organophosphorus pesticide used widely for effective control of a wide range of insects and mites on many vegetables, wheat, sorghum, cotton, apples, pears, safflower, lemons, oranges, grapefruit and ornamental plants such as roses, etc.

It is a well established product and is sold under different trade names such as Rogor, Trimeton, Roxion and Dimethogen. In plant protection, organophosphorus pesticides are preferred to chlorinated hydrocarbons such as DDT, Gammexane and Endrin since the organophosphorus pesticides have two distinct advantages over the chlorinated hydrocarbons. The former are much faster and more lethal in their action on pests, and are biodegradable.

Dimethoate is currently being manufactured by Rallis India Ltd, Bombay, and is marketed under the trade name Rogor. The current requirement of technical grade dimethoate, as estimated by the Directorate of Plant Protection, Quarantine and Storage, is around 1000 tonnes.

The National Chemical Laboratory (NCL), Poona, has developed a process for the manufacture of dimethoate (technical grade) starting from phosphorus pentasulphide. The process consists of the following steps: (i) preparation of O, O-dimethyldithiophosphoric acid (DDPA) from phosphorus pentasulphide and methanol, (ii) preparation of sodium salt of DDPA, (iii) preparation of methylchloroacetate, (iv) condensation of methylchloroacetate with sodium salt of DDPA, and (v) amidation of the resulting ester to obtain dimethoate, which is further dried. All the raw materials are indigenously available.

The process has been developed on a pilot plant scale of 10 kg/batch of technical grade dimethoate and the know-how is offered as a complete process package together with basic engineering design data. The product developed by the NCL process conforms to IS specifications for technical grade dimethoate.

Shaw Wallace & Co., Calcutta, are setting up a 150 tonnes/annum plant at Haldia, based on the NCL process. The plant is expected to start functioning by the middle of 1979 or early 1980. The value of 150 tonnes of dimethoate (technical grade) at the

present market price would be around Rs 110 lakh.

A few more firms have also shown interest in acquiring the NCL technology for manufacture of dimethoate.

Maintenance of Scientific and Medical Instruments: NPL

The problem of instrument repairs is acute in the developing countries which have to import such instruments. In India, this problem can be handled best by the university physics departments, Indian Institutes of Technology, CSIR laboratories and other such organizations, by setting up their own in-house facilities and also attending to the work of smaller institutions around them.

Because of the vast variety of instruments it is difficult for the general establishments to service them. In the country of manufacture the usual arrangement is to send the instrument back to the manufacturer and this is the most appropriate thing to do because the manufacturer has the skills, test equipment and also the spares for it. Unfortunately, this arrangement is not practicable once the apparatus is exported, as the numbers are not large enough for the manufacturer's agent to provide continuous after-sales service. Also, India

is too vast a country for a central facility to be feasible even if it were contemplated.

The problem of proper spares is also acute because except in the case of purely electronic instruments, specific spares for specific optical or opto-electronic instruments, etc. are not available in the open market and these have to be obtained from the manufacturers only. Another factor to reckon with is the obsolescence of such instruments. Technology is moving so fast that instruments made five years ago are no longer serviceable, whether used or not, as new models appear and components used in the earlier ones are no longer available. A case in point is the fast transition from radio tubes to transistors to integrated circuits, and the progress continues.

The National Physical Laboratory (NPL), New Delhi, has its own service facility set up more than a decade ago for its own multi-disciplinary instruments. The laboratory has been providing servicing facility to individuals, institutions and hospitals not only in Delhi but elsewhere around Delhi. Scientific instruments serviced include makes other than Indian.

In most of the cases, the user is requested to demonstrate the complaint physically to ascertain whether

the machine was used properly and whether it has a genuine trouble. The user is invited to check the apparatus before delivery after repair.

NPL is the only legal civilian calibrating authority in India for a variety of physics parameters concerning precision measuring instruments and such instruments have to be calibrated after every breakdown. Calibration for many parameters such as length, mass, frequency, temperature, force and intensity of light are routine facilities in the respective departments and so no new or temporary set-ups are necessary.

In the case of apparatus installed or delicate apparatus which are not recommended to be moved, NPL provides an on-site inspection facility. This is limited to the diagnosis of the area of fault and explaining to the local engineer the method of rectifying the defect in case readjustments alone will not make it operative.

In the absence of an up-to-date and reliable directory of scientific instruments and components, NPL provides a buyer's guide type of service also for apparatus and components of Indian make. The information includes the addresses of the manufacturers or dealers, the specifications of the apparatus or substitutes, etc. based on the information collected from profes-



A vast variety of scientific and electromedical instruments comes to NPL, New Delhi, for repair and correctional calibration. Shown here are (from left) flame photometer, pH meter, eye perimeter, photocalorimeter, RF generator, audio-oscillator, ac millivoltmeter and eye amblyoscope.

sional and trade magazines dealing with electronics or instruments, from the manufacturers' pamphlets or from the critical survey of the exhibition of instruments held frequently in Delhi. This service is free of charge.

Typical apparatus received by NPL for diagnosis and rectification of defects and calibration are: (i) scientific and industrial apparatus like oscilloscopes, flaw detectors, pH meters, microvoltmeters, spectrophotometers, flame photometers, potentiometric recorders, polarographs, proportional controllers, research microscopes, monopan microbalances, moisture and gas analyzers, differential thermal analyzers, and X-Y recorders; and (ii) electro-medical instruments like electrocardiographs, ophthalmoscopes, tissue processors, pathological microscopes, cystoscopes, fundus camera, slit lamp, tonometer, jet inoculators, photocalorimeters, and instruments for ultrasonic therapy, electroconvulsive therapy and surgical diathermy.

Techno-economic Feasibility Report on Vertical Shaft Kiln Cement Plant

The Regional Research Laboratory (RRL), Jorhat, has prepared a techno-economic feasibility report for 30 tonnes/day capacity cement plant based on its work. This 30-page mimeographed report covers, among other things, equipment and layout for vertical shaft kiln plant; raw materials specifications; typical product analysis; and capital investment, cost economics and profitability. Other useful information like workshop facilities, laboratory equipment, project capital cost, raw materials and utilities requirement, and power requirements are also included.

The report shows that under the Indian conditions the adoption of shaft kiln plant for manufacture of cement is well suited, particularly to utilize the limited reserves of raw materials which do not warrant the setting up of large-size conventional plants. Transportation bottlenecks in certain

areas also demand need-based production, and shaft kiln is best suited. The intensive search for finding an economic sintering machine will be virtually solved if the shaft kiln plant is given due consideration. The high thermal efficiency of the process helps smooth operation and the low investment cost makes the shaft kiln plant of as low a capacity as 30 tonnes/day sufficiently attractive for producing cement economically. Setting up of small-scale cement plants throughout the country may be within the reach of many entrepreneurs. Establishment of such shaft kiln plants will not only decentralize the production of cement, but also generate employment avenues in remote and dispersed areas. The cost of plant and machinery (all indigenous) for a 30 tonnes/day vertical shaft kiln plant based on RRL (Jorhat) know-how and design has been estimated at Rs 26 lakh. The total project investment works out to be Rs 41.40 lakh. The return on investment will be 15%.

Industrial News Digest

This bulletin was started by the Publications & Information Directorate, New Delhi, in 1977, as an experimental bi-monthly for disseminating packaged information on industrial processes, products and policies. Five pilot fascicules of the digest were brought out during 1977. On encouraging response from its users, comprising industrialists, entrepreneurs, and experts in both government and private industrial management organizations, it has been decided to bring out the bulletin as a monthly from January 1978.

Engines Laboratory: IIP

The Engines Laboratory of the Indian Institute of Petroleum (IIP), Dehra Dun, is one of the special facilities of the institute. The laboratory, established in 1964 with the technical collaboration of the Institut Francais du Petrole, France, has a comprehensive range of engine test benches and rigs. A brochure on the laboratory has

recently been brought out by IIP. Copies of the brochure can be had from: The Director, Indian Institute of Petroleum, Dehra Dun 248005.

Deputation Briefs

Dr L. K. Doraiswamy of the National Chemical Laboratory (NCL), Poona, was at the University of Wisconsin in USA for two semesters and at the McMaster University in Canada for two months as a visiting professor. He came back to NCL on 7 November 1977. At the Department of Chemical Engineering in the University of Wisconsin, Dr Doraiswamy was in charge of a course on the strategy of process design and was also one of the professors responsible for the laboratory experiments in chemical engineering. He was also associated with some of the research schemes in the department. Dr Doraiswamy was professor in charge, along with Prof. T. Chapman, of a project undertaken by the State of Wisconsin for preparing a project report on the winning of zinc from massive deposits of low-grade zinc ore recently discovered in upper Wisconsin. For this purpose Dr Doraiswamy had a series of meetings with several firms interested in exploiting the ore. A report has been handed over to the authorities in Wisconsin.

At McMaster Dr Doraiswamy was associated with a course on process design and gave seminars on chemical reactor analysis.

Dr Doraiswamy was one of the members of a panel consisting of chemical engineers from several countries to discuss the present state of knowledge on gas-solid reactions and to propose a programme of research for the next several years. This panel discussion was organized by the American Institute of Chemical Engineers in Houston in March 1977 and Dr Doraiswamy was one of the invitees to participate in the panel. He also presented a paper on a novel model for gas-solid reactions, the so-called expanding reaction and the so-called expanding core model.

Dr C. Siva Raman of the National Chemical Laboratory, Poona, visited USA from 20 October to 24 November 1977 under the National Science Foundation-CSIR Exchange of Scientists programme. During his stay in USA, he visited the Department of Microbiology, Louisiana State University, Baton Rouge, where work on cellulose fermentation was being carried out on a pilot plant scale; Veterans Administration Hospital, Dallas, Texas, where pioneering work on citrate lyases was in progress; Corning Glass Works, Corning, New York, where industrial and medical applications of immobilized enzymes were being developed; and the Department of Biological Sciences, State University of New York, Albany, where nitrogen-fixation by *Rhizobia* and the possibility of transfer of the gene to plant cells were being studied. Dr Siva Raman gave seminars at these laboratories.

* * *

Dr M. A. Ramaswamy of the National Aeronautical Laboratory (NAL), Bangalore, attended, on deputation, the 48th meeting of Supersonic Tunnel Association (STA) on 14 and 15 September 1977 and also visited the wind tunnel facilities at Le Fauga and Modane in France, at DFVLR at Gottingen in West Germany, at National Aerospace Laboratory in Amsterdam, and at Aeronautical Research Association and Royal Aeronautical Establishment in Bedford, UK.

The Supersonic Tunnel Association has the broad objectives of providing, at the operational level, a means of interchanging ideas in the area of wind tunnel operation, instrumentation and data acquisition systems, and new testing techniques related primarily to high-speed wind tunnels. Twenty-four papers were presented at the STA meeting which covered: Tunnel operational problems; Measurement of unsteady flows; New data acquisition system to enhance the capability of facilities; and Special testing techniques such as dynamic stability measurement, testing of integrated aerodynamic and

propulsion effects, and air intake and airframe integration testing.

Dr Ramaswamy presented a paper highlighting special testing techniques developed at NAL for measurements of interference effects between stores such as missiles and bombs and the parent aircraft model, aeroelastic studies like flutter and divergence, and heat transfer studies by pre-cooling the model with liquid nitrogen before the tunnel run.

During his visit to the various wind tunnel facilities, Dr Ramaswamy observed the techniques used for fabricating and testing complicated models incorporating intake and exhaust simulation; the techniques used for design, fabrication and calibration of wind tunnel balances; and captive trajectory technique used for stores separation studies. He also held extensive discussions.

* * *

Prof. A. Rahman, Chief (Planning), CSIR, and Head, Centre for the Study of Science, Technology and Development, was deputed by CSIR to participate in the meeting of UN experts for United Nations Conference on 'Science, Technology and Development' held in Geneva from 21 to 25 November 1977.

The meeting was convened as a prelude to the forthcoming United Nations Conference on Science and Technology in order to discuss, review and finalize one of the important items on the agenda, viz. 'Science, technology and the future', in the light of the latest developments in the fields of science and technology.

During his brief sojourn abroad, Prof. Rahman was invited to deliver lectures at the University of Lund, Sweden; Scandinavian Institute of Asian Studies, Copenhagen; and Science Policy Group, Oslo. He also exchanged thoughts on various scientific matters of bilateral interest.

* * *

Dr C. K. Das of the Central Fuel Research Institute (CFRI), Dhanbad, visited West Germany, on deputation, under the German Academic Exchange

Service (DAAD) programme, for a period of two years. He returned to CFRI on 14 October 1977.

Dr Das was engaged in the newer aspects of research on Fischer-Tropsch synthesis for production of synthetic oil, using a finely divided nickel catalyst obtained by the decomposition of nickel tetracarbonyl, the latter being passed through a hydrocarbon medium. Synthesis was effected by passing the synthesis gas through the hydrocarbon medium dispersed with fine nickel. The work is important in the sense that Fischer-Tropsch synthesis is now gaining more ground in the conversion of coal to oil as an alternative source of energy, particularly in India which has a sizable reserve of coal but where petroleum has to be largely imported.

Dr Das conducted research work under the guidance of Prof. Hans Schulz of Engler Bunte Institute, Universität Karlsruhe, Karlsruhe.

PROGRESS REPORTS

CECRI Annual Report : 1976

The Central Electrochemical Research Institute (CECRI), Karaikudi, has published its annual report for 1976. According to the report the institute continued to carry on its R & D activities in the fields of batteries; corrosion prevention; electrometallurgy and electrothermics; electro-organic and electro-inorganic products; electroplating, electrodeposition and metal finishing; electrode kinetics, electrochemical equilibria and electro-analysis; and solid state electrochemistry. Four licensees went into production on the following processes : nickel-cadmium button cells, self-regulating high-speed chrome salt, aluminium alloy anodes for cathode protection, and iron powder from millscale. The National Research Development Corporation of India released 12 CECRI processes; ten new processes were assigned to the corporation for release to interested parties.

A liquid concentrate has been developed which when added to water used

in mixing concrete can offer protection to the concrete constructions against corrosion. The product is expected to be required in large quantities for protecting coastal structures.

CECRI also developed a protective coating formulation for structural steel. It consists of a suitable corrosion inhibitor and portland cement mixed in suitable proportion to form a slurry. The slurry can be applied to steel surface by brushing, dipping or spraying. This is followed by a coating of water glass. The inhibitor used in the formulation is available indigenously. The performance of the formulation has been found to be satisfactory by the authorities who have tried this in the construction of Pamban bridge.

A lead sulphide based photoconducting element has been developed for locating infrared radiations. These sensing elements are incorporated in devices used for locating a hot object (target for attack) by military personnel or for giving warning when certain parts in a machinery get overheated. They also find application in the field of communications, IR spectroscopy and geological investigations. The sensitivity of the detecting elements developed at the institute is comparable to that of commercially available products.

A process has been developed for making electrostatic photographic paper used in document copying. It consists in giving a coating of light-sensitive zinc oxide on a pretreated base paper. The raw materials and machinery for this process are indigenously available.

A degreasing solution based on alkaline inorganic compounds has been developed which can remove all types of mineral oils, vegetable oil and greases. The process consists in mixing different indigenously available constituents with water under stirred conditions to get a concentrated solution which is further diluted to 10 to 20 times during actual use.

A process for obtaining pigment grade calcium chromate from chromic

acid and slaked lime has been developed. The product so obtained is free from chloride contamination and alkalinity. The estimated demand for chromate pigments is 2000-3000 tonnes/annum and is presently met by other pigments like zinc chromate, red lead, etc.

A composition to convert rust formed on mild steel surface into a protective coating has been developed. The converted surface has been found to act as a good base for painting and also found to increase the paint life.

An acid inhibitor composition in solid form used for the inhibition of corrosion during pickling of ferrous items has been developed. It serves as an additive to hydrochloric acid pickling bath at ambient and elevated temperatures for (i) minimizing the base metal attack, (ii) minimizing hydrogen embrittlement, and (iii) producing a bright surface.

A chromate bath for chromate treatment of zinc and die cast zinc alloy has also been developed. The bath is prepared by mixing a few chemicals in suitable proportions. The components after degreasing and pickling are treated in the bath at 30°C for 20-60 sec. to get the desired chromate film. Large scale trials carried out by a carburettor firm in Madras have been found to be satisfactory.

Twenty-seven patents were filed and forty-five papers were published during the year.

ATIRA Annual Report : 1976-77

The Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad, has brought out its annual report for 1976-77. The 62-page (demy 4to) report shows that the instruments, processes and products developed at ATIRA were in great demand by the industry. ATIRA received the Federation of Indian Chambers of Commerce & Industry's award for 1976 in recognition of its significant work in conservation of fuel and electrical energy in

the textile industry. ATIRA has been assisting several mills by preparing detailed reports for their modernization with a view to getting soft loans. These reports examine the proposed product mix and the mills' capability to manufacture it successfully, technological requirements of machinery related to product mix, their priorities, expected returns on investment, etc. The Association offered 19 short-term courses covering the fields of spinning, weaving, wet processing, engineering, management, analysis and testing. One hundred and forty-three technicians from 27 mills attended these courses.

Several new printing styles have been developed and offered free of cost to member mills. Durable press-cotton bedsheets have been produced in experimental quantities. The finished bedsheets satisfy all international specifications. This know-how is expected to be useful to the member mills who are large producers of sheetings, particularly for the export market.

ATIRA has developed a nip load meter for measuring the roller pressures at draw frames. Preliminary investigations in mills have shown that there is a wide variation in roller pressure on modern high-speed draw frames. The meter has undergone field trials successfully.

The validity of accelerated test for the study of roller lapping at ring frames has been confirmed. The factors responsible for excessive roller lapping have been identified. Apart from the average end breakage rate and spindle allocation, other causes of roller lapping are: suction pressure, setting between the suction nozzle and the roller, relative humidity in the spinning department, cleanliness of the top rollers, yarn count and the type of cottons. A manometer has been designed and evaluated for checking suction pressure at individual spindles. This instrument will be available to mills from ATIRA.

For determining the solid content in size pastes, a starch refractometer has been developed. The gadget will be

useful to mills in quality control in size preparation.

Under a project for obtaining higher speed on plain looms, one prototype loom with the necessary modification in the design of the drive and the shedding and picking mechanisms was evaluated. After confirming the satisfactory working of the loom, four looms were modified in two mills to run at 10% higher speeds. The four modified looms have been running smoothly after minor changes in the clutch design, and a 10% increase in speed and 8% increase in production have been achieved. Further refinements in design are planned for achieving 20% or higher increase in production.

The project on computerized prediction of recipes in vat dyeing has been completed. On the basis of analysis of a number of samples submitted by mills, it has been observed that the accuracy of prediction is about 70% for light shades and somewhat lower for dark shades. In a large number of cases, the computer-predicated formulation has been found to be cheaper than those normally used by mills. Computerized colour matching is now available to member mills as a routine service.

A PL-480 sponsored project on the effect of cell-wall thickness on fibre properties was nearing completion. The tensile strength and the bending fatigue of the fibres have been studied in relation to cell-wall thickness. The number of flexural cycles required to rupture the fibre has been found to be directly dependent on the cell-wall thickness; the correlation coefficient between these two parameters is around 0.95.

Forty-four papers were published and 12 patents filed during the year.

PERSONNEL NEWS

Appointments/Promotions

Dr K. Y. Shrikhande

Dr K. Y. Shrikhande, Officer in charge of the Coal Survey Laboratory at

Nagpur, of the Central Fuel Research Institute (CFRI), Dhanbad, has been promoted as Scientist E II (17 Dec. 1975).

Dr Shrikhande (born 1928) obtained his M. Sc. (Tech.) in industrial chemistry (1948) from the Banaras Hindu University (BHU), Varanasi. After working for about a year as a research assistant in the College of Technology (BHU) on a CSIR scheme he joined CFRI in 1949. He obtained his Ph. D. in 1960 from BHU.

At CFRI, Dr Shrikhande has worked on diverse fuel problems related to fluidization, coal gasification, coal carbonization and briquetting of coal and coke. Besides his regular assignment as officer in charge of Low Temperature Coal Carbonization Section, he was the Chief Information Officer of CFRI from January 1965 to December 1968.

Dr Shrikhande went to the Massachusetts Institute of Technology in 1952 to study the fluidization technique. He was deputed to Fuel Research Station, Greenwich, in 1957, where he received training in low/medium temperature carbonization of coals in narrow continuous vertical retorts.

Dr Shrikhande is a fellow of the Institute of Chemists (India), member of Coke Oven Managers' Association (UK) and member of the Institute of Fuel (UK). He has been on a number of committees of the Indian Standards Institution.

Dr Shrikhande has about 50 papers and three patents to his credit.

Retirements

Dr S. L. Kapur

Dr S. L. Kapur, Scientist F, National Chemical Laboratory (NCL), Poona, retired on 31 December 1977 after serving the Board of Scientific & Industrial Research (BSIR) and CSIR for over 37 years.

After receiving M. Sc. from the University of Panjab, Dr Kapur joined BSIR in October 1940 at its temporary laboratories in Calcutta. He proceeded to USA for higher studies in 1945

under a Government of India scholarship and obtained his M. S. and Ph.D. degrees in the field of polymers at the Polytechnic Institute of New York.

On his return, he joined NCL as Senior Scientific Officer and head of the Polymer Division in May 1949. He was promoted as Assistant Director in 1954 and as Deputy Director in 1970. Dr



Kapur has developed several processes which are already being commercially exploited, e.g. processes relating to manufacture of nitrile rubber, styrene base cation exchange resin, filters for tubewells, microfilters, can-lining compositions and polyurethane base printing rollers.

In fundamental research, Dr Kapur has investigated a number of problems in kinetics of polymerization reactions, solution behaviour of polymers and stereospecific polymerization by Ziegler-Natta catalysts. On invitation from Prof. Natta, Nobel Laureate, Dr Kapur visited his laboratories in Italy and delivered lectures in this field. He was also invited by IUPAC to deliver a special lecture on stereospecific polymerization at an international symposium at Boston, USA, in 1971. He is a member of the American Association for Advancement of Science, Phi Lambda Upsilon, and Sigma XI. He received the Inventions Promotion Boards' award in 1967 for his process on rigid sand filters for tubewells. He is also recipient of Dr K. G. Naik gold medal for 1975 for his contribution to polymer industry. A fellow of the Maharashtra Academy of Sciences, Dr Kapur has been a technical consultant to polymer industries and has been associated with several committees for the development of polymer industries in the country. In connection with scientific conferences and study tours, he has visited USA, USSR, UK, Czechoslovakia, Italy and West Germany.

During his stay of about 37 years with CSIR, he has published more than 135 research papers and taken 13 patents. Fourteen students have received their Ph.D. and M.Sc. degrees under him.

PATENTS FILED

161/Mas/77: Improvements in or relating to the preparation of resins for bonding lignocellulosic materials having silicious surfaces such as rice husk and bamboo, J. George, S.S. Zoolagud, G. D. Surendar, T. R. N. Prasad, T. S. Rangaraju & K. Kummancheri Mohandas—IPIRI, Bangalore.

186/Del/77: "Eceemark" semi-automatic electrochemical marking machine, S. K. Basu, R. C. Bishnu & B. R. Guha—CMERI, Durgapur.

187/Del/77: Improvements in or relating to formation process for producing the high-quality aluminium oxide films suitable for use in high-voltage electrolytic capacitor, B.A. Shenoi, K.R. Narasimhan, V. Lakshminarasimhan, D. Kanagaraj & A. Perumal—CECRI, Karaikudi.

230/Del/77: A precision wire tensioner, D. Rajanna—NAL, Bangalore.

237/Del/77: Improvements in or relating to starch based compound binder for briquetting for char fines or like materials to produce smokeless domestic fuel, Abu. N. E. Rahman & D. P. Agrawal—RRL, Hyderabad.

240/Del/77: Improvements in or relating to zinc-lead dioxide batteries, P. B. Mathur, P. N. Namboodiri & R. Balasubramanian—CECRI, Karaikudi.

295/Del/77: An improved type of ultrasonic air transducer for automation, sensing and remote control applications, V. N. Bindal & M. Chandra—NPL, New Delhi.

318/Del/77: Improvements in or relating to a process of manufacturing of thin film resistors, resistor networks and/or hybrid circuits, S. C. Bawa, D. P. Runthala & B. R. Marathe—CEERI, Pilani.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 1/78*

It is proposed to appoint a Director for the Industrial Toxicology Research Centre, Lucknow.

This is a top R & D management position in CSIR in the toxicology field. The Director should provide leadership in identification of R & D needs concerning industrial toxicology. The major areas of research are: harmful effects of substances encountered in agriculture, mining, and metallurgical, chemical, food and other industries; mode of action of industrial toxins and mechanism of tissue damage, and preventive measures; and environmental problems due to industrial and noxious gases, pesticides, etc. The Director is a director of research, an able administrator and an image-builder to the centre.

Qualifications & Experience: High academic qualifications, fellowship/membership of learned scientific societies/professional bodies and extensive research experience in one or more aspects of industrial and environmental toxicology.

The Director is expected to be an able and creative individual in the profession, project an excellent image of the centre and initiate fruitful dialogues with users of R & D results including industries and government agencies as well as central ministries and undertakings concerned with the application of results of research of the institute.

Salary & Conditions of Service: The salary scale attached to the post is Rs 2500-125/2-3000. Initial pay will be fixed according to merit. It is a tenure post. The person selected will be appointed on contract for a period of six years, subject to confirmation of the contract after two years of satisfactory service. Other conditions of the contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Advertisement No. 2/78*

It is proposed to appoint a Scientist F (Deputy Director) for the Central Drug Research Institute, Lucknow.

Job Requirements: This is a senior research position and the incumbent will be required to provide high-level leadership in the discipline of biochemistry and interact with other bio-medical disciplines in the institute. He will be responsible for planning, conducting, monitoring and evaluating research programmes for multi-disciplinary projects in the areas of tropical diseases, particularly immunological and immunochemical aspects, reproductive physiology, enzymology, microbial metabolism and basic investigations in membrane biochemistry and other fields of molecular biology. He should be able to command the confidence of researchers in these fields and is expected to assist the Director in the research and administrative management of the institute and to liaise with scientific organizations and educational institutions.

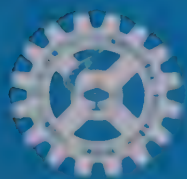
Qualifications & Experience: High academic qualifications in biochemistry, molecular biology or related areas with a Ph. D. degree and consistently excellent academic career; outstanding record of research and development in his field of specialization as evidenced by research publications, monographs, books and patents; at least 10 years' experience in a responsible research management position in an R & D organization with proven ability to guide a multi-disciplinary research team.

Salary & Conditions of Service: The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years (including the period of probation) after successful completion of the probation period of two years. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

*Scientists/technologists interested in the above posts may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual reports of these laboratories. Completed *curriculum vitae* proforma should be received in this office on or before 7 March 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the posts.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

CFTRI Develops Technology for Biostats

The Central Food Technological Research Institute (CFTRI), Mysore, has successfully developed the technology for manufacturing highly automated laboratory biostats. Biostats are essential tools for development and optimization of industrial fermentation processes in the production of antibiotics, vitamins, steroids, enzymes, organic acids, foods and chemicals. There is a growing need for highly automated and controlled laboratory biostats for microbiological, biochemical and pharmaceutical research in the country. Since technology for their

manufacture was not available in India, there was a proposal before the Government of India sometime back to import technology for this purpose at a cost of nearly Rs 24 lakh in foreign exchange. In view of the facilities available at CFTRI, the task of developing indigenous technology was assigned to the institute about eight months ago. The institute has now succeeded in perfecting the technology for manufacture of biostats, and has fabricated a prototype unit which is evincing a great deal of interest in research organizations and industry.

The prototype unit fabricated by CFTRI is equipped with automatic control systems for temperature, pH, dissolved oxygen and foam. It is provided with a magnetically coupled variable speed agitation drive, electronic air flow monitor, continuous culture facility and a six-point recorder for continuous recording of temperature, pH, dissolved oxygen and acid/base feed rates. An audio-visual alarm for power, air and cooling water failures and operator's call for pH and foam controls is also incorporated in the system. The biostat has computer compatibility with digital readout of control parameters.

Composite Binder for Briquetting Carbonaceous Materials

The Central Fuel Research Institute (CFRI), Dhanbad, has developed a composite binder for producing briquette fuels for domestic use from char, coke fine, semi-anthracite, and other similar substances. The composite binder is processed on a starch

formulation containing bitumen in a well-dispersed state. The green briquettes produced by using this binder are given thermal treatment at a comparatively low temperature by hot flue gas to yield strong domestic briquette fuels possessing reasonable water resistivity and smokelessness. A continuous binder preparation unit for producing briquettes (1 tonne/hr) has been designed, installed and operated at CFRI. Use of the new binder in some commercial plants is being considered.

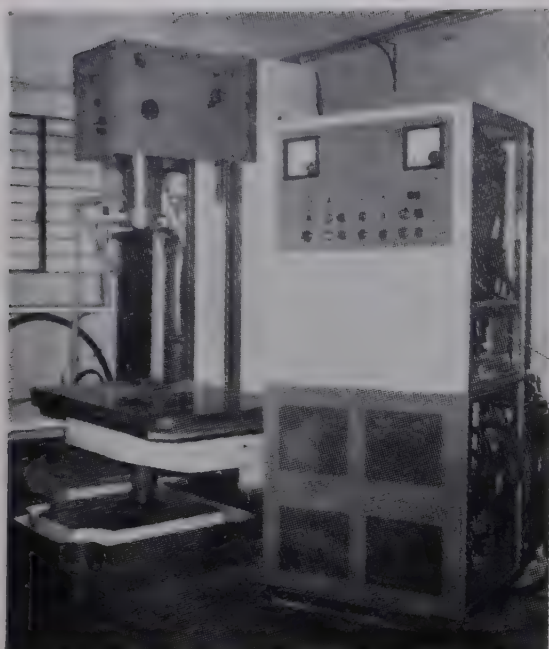
NAL Fabricates Electrochemical Machining Machine for Southern Railway

Electrochemical machining (ECM) is an unconventional process of metal removal which is gradually replacing the conventional processes for special applications in aerospace and general engineering industries. This system of milling owes its development to these industries not only because super-alloys, high-strength or high-temperature materials are used but because the shapes required involve 2-D and 3-D contours, which are very difficult to machine by conventional methods.

A facility for electrochemical machining of metals has been created at the National Aeronautical Laboratory (NAL), Bangalore. The laboratory has recently designed, fabricated and commissioned for the Southern Railway a special-purpose machine for milling nozzle rings. The machine and its accessories are all indigenous and have been designed for producing 75 nozzle rings a year. The tool required



Highly automated laboratory biostat developed by CFTRI, Mysore



Machine tool part of ECM : NAL, Bangalore for machining nozzles is nearing completion.

The machine tool part is a C frame generally used for heavy-duty drilling and boring. It consists of a 2-m tall column, bolted to a strong cast iron base. The tool drive unit with the stainless steel (SS) quill is fixed at the top of the column. The 36-station special-purpose indexing head and the stainless steel shaft to carry the job are mounted on a black granite working table. The work enclosure is

made of acrylic. The pumps used are made of SS 316 and the plumbing is made of PVC rubber and stainless steel valves. There is a provision for pressure gauges to adjust flows. Temperature is precisely controlled using SS cooling coil and a control system. The cooling water is recirculated using a spray pond. A settling tank with associated controls clarifies the electrolyte. The power-pack has sophisticated controls to protect the tool from spark damage.

The control console has various safety interlocks and sequence programmes for reducing demands on the operator. A digital tool position indicator and controller monitor the progress of machining.

The hollow tool made of brass has been designed for a trepanning type of operation. It can plunge into the job at 1 mm/min. during the machining. It eats away the material around the blade profile and at the end of the stroke, one blade is left inside the tool. The system shuts down automatically and the operator is not involved in the actual machining. The operator takes up the tool fast just after the machining is over, indexes the job to

the next position and starts the automatic sequence for machining.

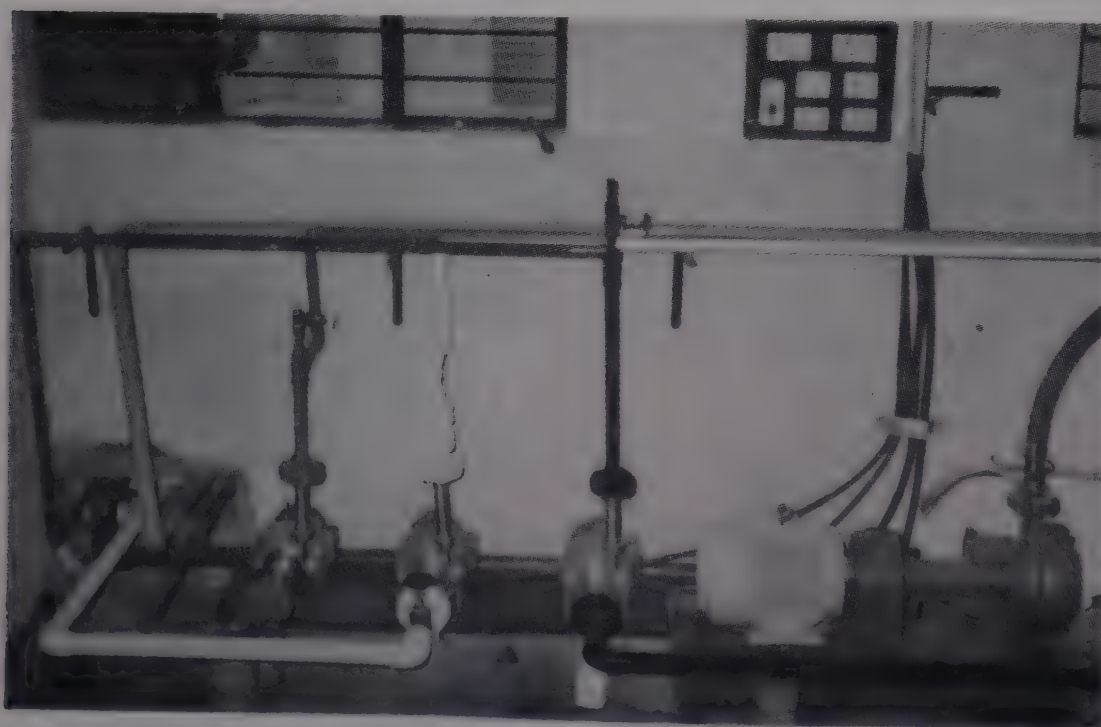
Audible and visual indicators are provided to show the state of the system at all times. Alarms alert the operators. Since heavy currents are required during the operation of ECM systems, all fixtures are made of heavy brass sections to reduce thermal expansion.

Developmental Work on Carbon Black

The Regional Research Laboratory, Jorhat, has taken up developmental work on carbon black from Assam coal in association with Union Carbon Black Ltd (UCBL), Gauhati, and the National Research Development Corporation (NRDC) of India. A miniature carbon black plant (200 kg/day) will be built up in the laboratory campus with a view to establishing the various reaction parameters and training the operating staff for a commercial plant. During the course of the study, about 30 tonnes of carbon black, which is expected to be obtained, will be made available to UCBL for market study and promotion. The project is being financed jointly by UCBL, Assam Industrial Development Corporation (AIDC), and NRDC. The laboratory embarked on the project for development of know-how for production of carbon black from Assam coal in 1972. Intensive studies both on laboratory and pilot plant scales have led to this know-how. Engineers India Ltd, which carried out a techno-economic feasibility study of the process, recommended the process for its attractive yields, good product specifications and sound premises. The process was licensed to UCBL.

Additive for Reducing Running-in Period of Heavy Vehicle Engines

The Indian Institute of Petroleum (IIP), Dehra Dun, has developed an additive for reducing the 'running-in' period of the new and re-conditioned



Pumps used in ECM developed at NAL, Bangalore

heavy vehicle engines. The additive compares well with the imported additive Shell-D. Extensive trials carried out at IIP and defence laboratories have proved its effectiveness to replace the imported additive. The Controllate of Inspection of Heavy Vehicles, Avadi, has recommended this new additive as a substitute to Shell-D. The IIP additive is likely to reduce the dependence of defence industry on imported additive.

Metallic Contact Indicator

The Indian Institute of Petroleum(IIP), Dehra Dun, has designed and developed a metallic contact indicator which basically estimates and indicates the failure of lubricant film by the onset of metal-to-metal contact. The device has been extensively used for lubricant evaluation in ball-disc machine. Whenever the stable oil film between the rotating disc and the ball under particular load breaks, a contact takes place between the ball and the disc. These contacts are of random nature, and over a period, their effect is felt in the form of wear of ball and disc.

From the circuit point of view, the instrument uses a two-arm resistance

bridge, sensitive fast comparator, square wave generator, gate and integrator. The two-arm resistance bridge operates on a stable dc potential, the oil film resistance being one of the arms. The comparator swings to either positive or negative voltage side depending upon whether there is a contact between the ball and the disc. The square pulses are allowed to go through the gate only if there is a metal-to-metal contact. The integrator accepts these square pulses and integrates them over the desired period. The output of the integrator directly indicates the percentage metal contact duration, 100% being defined as a condition when lubricant films do not separate the surface.

The accuracy of the indicator is 2.5% and its sensitivity, 1%.

The device finds wide use in tribological studies, in which the behaviour of metals in lubricated friction is studied. The technique helps in understanding the mechanism of action of extreme pressure and antiwear additives and also in studying the influence of surface roughness in lubrication. This has also potential application in

distinguishing the performance of different antiwear additives.

Reforming Catalyst Regeneration at Haldia Refinery

IIP's Technical Assistance

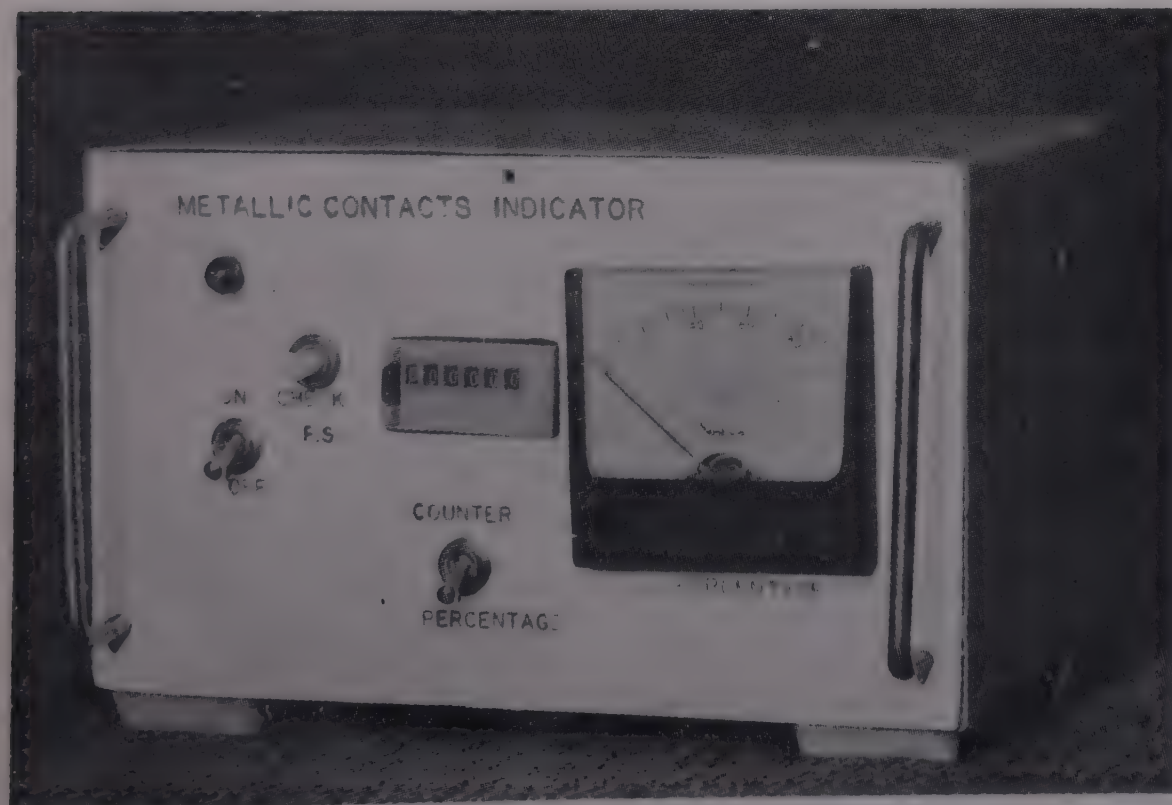
The Indian Institute of Petroleum (IIP), Dehra Dun, in collaboration with the Institut Francais du Petrole (IFP), France, has licensed a catalytic reforming unit to Haldia Refinery of Indian Oil Corporation Ltd (IOCL) for improvement of octane number. This plant was successfully commissioned in December 1974 and was accepted by the refinery after performance guarantee test run. The plant was since operating satisfactorily. After processing about 1,50,000 tonnes of naphtha, the catalyst was required to be regenerated owing to normal decline in activity.

An IIP team comprising Dr K. M. Murad, Shri Mohan Lal and Shri S. Patil supervised the catalyst regeneration operation at the request of IOCL during November 1977. The plant has been re-started after successful catalyst regeneration. Regeneration of the catalyst is carried out *in situ* by controlled combustion of coke deposited on the catalyst by air diluted with nitrogen. This is then followed by oxidation and oxychlorination of the catalyst.

The guaranteed catalyst can process 35,000 tonnes of feedstock per tonne of catalyst charge with three regenerations. At Haldia Refinery, it has processed 22,000 tonnes of feedstock per tonne of catalyst before first regeneration. This shows that the catalyst is serving well as it has given performance equivalent to about 60% of its total guaranteed life before first regeneration even though the refinery had several crash shutdowns because of power or steam failures.

Airborne Geophysical Surveys by NGRI

On request from the North-Eastern Council, the National Geophysical Research Institute (NGRI), Hydera-



Metallic contact indicator developed by IIP, Dehra Dun

bad, has taken up an aeromagnetic survey covering 14,600 line-km over an area of 22,000 sq. km in Assam and Meghalaya. The cost of the survey is estimated at Rs 10 lakh. The survey deploys a rubidium vapour magnetometer designed and fabricated at NGRI. Position location is controlled by an atomic navigation system acquired from West Germany and supplemented by a 35 mm tracking camera.

At the request of Oil India Ltd (OIL), aeromagnetic survey of parts of the eastern Brahmaputra valley will be taken up shortly. This task involves 7600 line-km of production flying covering an area of about 8900 sq. km at an estimated cost of Rs 5.30 lakh. A similar survey, covering about 32,300 sq. km (over 21,000 line-km) in Mahanadi delta area (on land and offshore), is also expected to be taken up shortly at the request of OIL at an estimated cost of about Rs 14.00 lakh.

The institute has so far carried out aeromagnetic surveys over about 1,00,000 line-km in Karnataka, Madhya Pradesh and Uttar Pradesh. In some areas, a transient electromagnetic system was also employed. A copper enrichment zone has been located in Chitaldurga schist belt (Karnataka) on the basis of the airborne geophysical surveys and ground follow-up geophysical and geochemical surveys.

Deputation Briefs

Acharya M.V. Ramana Murty and Miss S. Seethalakshmi of the Central Leather Research Institute (CLRI), Madras, have returned to the institute after a successful completion of their deputation to Hong Kong and Indonesia on the invitation of Hong Kong Arts Centre. With their troupe of three puppeteers, they gave 11 performances of leather puppet shows in the two countries.

A unit set up in CLRI in 1962 to revive, develop and propagate the glory of the folk treasure, first studied the traditional methods of making parchment, manufacturing puppets and manipulating puppets and developed

new processes to make the parchment transparent and equivalent to plastics in many cases. It has developed methods for punching and colouring of puppets, and manipulating methods. The know-how in the art of leather puppetry has been improved and modernized with the latest equipment and techniques. The unit is finding the other utilities of the parchment to use it as decorative items like puppets, partition screens, lamp-shades, fans, portraits and attractive traditional and modern designs and paintings.

Ramana Murty and Seethalakshmi are internationally reputed for their performances. They have visited, on invitation, 16 countries and performed about 155 shows.

* * *

Dr P. M. Bhargava, Head of the Centre for Cellular and Molecular Biology at the Regional Research Laboratory, Hyderabad, was deputed to Nagoya, Japan, for attending the first congress of the Federation of Asian and Oceanian Biochemists (FAOB), held from 10 to 12 October 1977. He also attended the meeting of the council of FAOB as a representative of the (Indian) Society for Biological Chemists. He visited Osaka, Tokyo, Hong Kong and Bangkok and met biochemists there.

Dr Bhargava presented a paper at FAOB congress and was chairman of one of the sessions. Ways and means of increasing contacts amongst biochemists were discussed at the FAOB council meeting. The proposal to start a journal, *FAOB Letters*, was also discussed at the council meeting.

Dr Bhargava delivered an invited lecture in the Department of Biochemistry of the University of Hong Kong.

* * *

Dr C. Gopinathan of the National Chemical Laboratory, Poona, was deputed to the Nice University, France, during September-November 1977 to receive advanced training in the field of organometallic chemistry, particularly the synthesis and handling of air-sensitive and strategically important chemi-

cals. Dr Gopinathan visited other research institutions and research and development laboratories of industries; among these, the R & D laboratory of Rhone-Poulenc is worth mentioning. Here the work on direct synthesis of silicone intermediates was under way. Since there was a research project undertaken by NCL on silicone intermediates and since Dr Gopinathan was associated with it from its inception in 1968, his visit to the silicone plant, its R & D section and discussion with the scientists were very useful. The pilot plant on silicone intermediates at NCL has started working recently and his visit has helped in identifying the shortcomings in NCL process. Although Rhone-Poulenc produces silicone intermediates by a different route, its production is about 20 times the requirement in India. It produces methyl chlorosilanes from silicon, methyl chloride and copper catalyst at a rate of 4 tonnes/hr. Phenyl and phenyl-methyl chlorosilanes were also being produced in the plant. The firm is engaged in developing silicone formulations, testing facilities for regular and new items, and equipment for commercial applications.

PROGRESS REPORTS

RRL-Jorhat Report : 1975 & 1976

The progress report of the Regional Research Laboratory (RRL), Jorhat, for the calendar years 1975 and 1976 has been published recently. The report records the R & D work of the laboratory under the following functional areas : Analytical services, Applied civil engineering, Biochemistry, Chemical engineering, Geoscience, Inorganic chemistry, Medicinal & economic plants, Organic chemistry, Papers & boards, and Petroleum & natural gas. During the period, the charter and objectives of the laboratory were redefined, the functional areas and goals were specified, and the organizational structure of the laboratory was modified to suit the func-

nal areas. Twenty-five processes were licensed through the National Research Development Corporation of India to 59 parties; 18 processes were demonstrated to 36 parties and 10 processes were reported to be in commercial production by 15 firms. Besides, a large number of parties were cultivating the essential oil bearing plants by taking the farm technology and planting material from the laboratory. In north-eastern India, 6000 acres of land were brought under the cultivation of citronella alone.

In the area of Analytical Services, about 5000 samples were analyzed and a number of methods for estimation and chemical analysis were standardized. The Applied Civil Engineering Division worked on the development of process know-how for a cement-like product from paddy husk, and heat insulating boards. Work in the Biochemistry Division related to bakers' and food yeast from molasses, industrial enzymes, lactic acid, metabolism of hydrocarbons by microorganisms, microbial fat, microbial production of vitamin B₁₂, and sterols and fats from sugarcane soft wax.

The Chemical Engineering Division was mainly engaged in the development of know-how package for pesticides, caffeine from tea waste, and tartaric acid. Process development work on oxalic acid and fractionation of citronella oil was taken up. The Geoscience Group was mostly concerned with studies on the seismicity, geodynamics and seismotectonics of the north-eastern India. The work of the Inorganic Chemistry Division was concerned with the development of technology for aluminium sulphate from clay, beneficiation chemicals for minerals, molecular sieve, oil well cement additive, and pelletization of iron ore fines. The group also carried out investigation for preparation of active silica, sodium silicate, pozzolana cement and silica insulating bricks from paddy husk.

The R & D work in the Medicinal & Economic Plants Division pertained

to farm technology for *Solanum khasianum*, *Dioscorea*, Java citronella, *Eucalyptus citriodora*, lemongrass, *Mentha* sp., and palmarosa. Work on introduction of new economic plants and plant pathology was also continued. In the area of Organic Chemistry the work related to the process development for pesticides such as phosphamidon, quinalphos, chlorfenvinphos and mevinphos. Processes for solasodine from *S. khasianum*, plant growth regulators such as cycocel, and pharmaceutical intermediates such as 2-diethylaminoethanol and tri-*n*-butylphosphate were developed.

Process development work on speciality papers like industrial filter paper, 'no-carbon required' paper, and gasket paper was continued in the Papers and Boards Division. The Petroleum and Natural Gas Division concentrated its activities for development of a totally indigenous additive for depressing the pour point and viscosity of waxy crudes and thus making them amenable to pumping through pipeline without pre-treatment. Work on petrochemicals like thymol and diphenyl was continued.

The laboratory initiated steps to establish branch laboratories in the states of Arunachal Pradesh, Manipur, Meghalaya, Nagaland and Tripura. Demonstration - cum - experimental farms earlier established in Manipur, Meghalaya and Nagaland were in operation and medicinal and economic plants like *Mentha piperita*, *Pyrethrum* and *Valeriana*, besides Citronella and *E. citriodora*, were under cultivation. Cultivation of *Dioscorea* was taken up at Shipahijola in Tripura in association with the Forest Department. The laboratory offered consultancy services to government and private parties. In-plant study was made in the caffeine plant of Assam Pharma Co. to increase its efficiency. Two important feasibility reports on pesticides were prepared and sponsored research projects on cycocel and crystal structures of cyanine dye were completed. Interactions with the rural people of north-east

India were intensified and collaboration in R & D activities with various government organizations was established. Fifty-eight papers were published and 13 patents filed during this period.

Planning Division Report: 1973-76

The Planning Division of the Council of Scientific & Industrial Research has brought out a report of its activities during the period 1973-76. The report highlights the directions of the work of the division and its perspectives.

The division formulated the five-year plans and the annual plans of CSIR after identifying the areas of thrust in consultation with the scientists and directors of the laboratories regarding the methodology of project selection, determination of thrust and fixation of priorities in R & D programmes. A review of the fourth plan was also undertaken. In the formulation of new schemes during the fifth plan, a procedure was devised by which the project reports and the feasibility reports had to be examined in detail by a technical committee consisting of scientist representatives of the departments or institutions where work of a similar nature was in progress.

As a result of the mid-term appraisal undertaken by the group in collaboration with the Planning Commission, the outlay for the fifth five-year plan of CSIR was fixed at Rs 81.80 crore. The actual expenditures for the three years were : 1974-75, Rs 9.76 crore; 1975-76, Rs 11.9 crore; and 1976-77, Rs 14.59 crore. The outlay for 1977-78 was placed at Rs 20.00 crore.

The division introduced management training programmes to orient the administrative and accounts staff to the new methods of management of R & D institutions. The training group also introduced scientific personnel in the art of management.

Subsequent to the reorganization of CSIR headquarters the organizational responsibility of coordination of research programmes and projects was

entrusted to the division. This was done with a view to dovetailing the research activities in different laboratories and in other extramural organizations and thereby optimizing national resource inputs in the research system.

The main objective of the coordination group has been to bring together research projects at different research laboratories to make viable national programmes in an area, with the co-operation, whenever necessary, of institutions outside CSIR. In accordance with this policy guideline, efforts were initiated to analyze the research programmes in certain priority sectors like energy, steroids, minerals and metals and post-harvest technology, and appropriate action

was taken to bring coherence in the research efforts of relevant national institutions.

The Centre for the Study of Science, Technology and Development was engaged in multifarious activities relating to: planning of science and technology; dynamics of science, technology and society; scientific and technical manpower; alternative technologies; and historical development of science and its social role in different societal, cultural and national contexts. The division published a monthly entitled 'Current Literature on Science of Science'.

A number of colloquia, lectures and seminars on techniques and methodologies developed by the division and elsewhere in the world were arranged.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Ammonium Vanadate from Vanadium Sludge of Aluminium Industry

Ammonium vanadate finds application as catalyst in chemical industry. It is also used as a raw material in the manufacture of ferro-vanadium alloy. Ammonium vanadate is at present being manufactured by a firm in Bombay. However, its production is reported to be inadequate to meet the present requirement of the country. Considerable quantities of vanadium pentoxide are still being imported into the country.

The Regional Research Laboratory, Bhubaneswar, has developed a process for the preparation of ammonium vanadate from the vanadium sludge of aluminium industry. The process essentially depends on the differential solubility of various components of the sludge in ammonium and alkali salt solutions. Pure ammonium vanadate is obtained from the final leach solution by the addition of ammonium chloride.

The process has been studied on bench scale of 1.5 kg of ammonium vanadate per batch.

Sludge, soda ash, ammonium chloride and hydrochloric acid are the raw materials required in the process. All these are available indigenously.

The essential items of plant and machinery required are: MS tank (rubber-lined), vacuum drum filter, filter press (rubber-lined), tray/rotary drum drier, storage tanks, water overhead tank with pump, stirrers (SS), and bins for solid materials.

The suggested capacity of an economically viable unit is 92 tonnes of ammonium vanadate per annum. The total capital outlay required to put up such a unit is estimated at Rs 35.45 lakh, comprising a fixed capital on land and building of Rs 3.00 lakh, a fixed capital on plant of Rs 18.12 lakh, and a working capital of Rs 14.33 lakh. The cost of production has been worked out to be Rs 41,755 per tonne.

A smaller capacity plant of 8-10 tonnes per annum is also feasible.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

8-Hydroxyquinoline from Quinoline

The Central Drug Research Institute (CDRI), Lucknow, has developed a process for the conversion of quinoline to 8-hydroxyquinoline. The principal use of 8-hydroxyquinoline is as an intermediate for the production of halogenated 8-hydroxyquinolines, which are widely used for the treatment of gastro-intestinal infections of amoebic as well as bacterial origin. It also finds use as a fungicide and as an analytical reagent.

The demand for 8-hydroxyquinoline has been estimated at 450 tonnes by 1978-79 and 600 tonnes by 1983-84. The present demand is met by imports mainly, but a few indigenous manufacturers are producing 8-hydroxyquinoline for captive use. The imports of 8-hydroxyquinoline in 1975-76 amounted to about 54 tonnes, valued at about Rs 33.43 lakh.

The CDRI process consists of two stages. In the first stage, quinoline is sulphonated to give quinoline-8-sulphonic acid, and in the second stage, the hydrolysis of quinoline-8-sulphonic acid is carried out by alkali to yield 8-hydroxyquinoline.

The product obtained at CDRI is of technical grade (95-98%; mp 74-76 °C). Of the raw materials required, only quinoline has to be imported, other raw materials being available indigenously.

The suggested capacity for a plant is 30 tonnes/annum. The total capital outlay for the plant will be Rs 18.0 lakh, including a fixed capital on building of Rs 2.8 lakh; a fixed capital on plant of Rs 9.3 lakh; and a working capital of Rs 5.9 lakh. The cost of production of the product will be Rs 82/kg. The present market price of the product is Rs 120/kg.

The main equipment required are: oil-jacketed mild steel reactor (capacity, 700 litres) with 2 hp flameproof continuous ratio motor; four Nutsch filters (capacity, 200 litres); forced air

circulator drier; disintegrator (capacity, 200 kg/hr) with 5-hp motor; fusion reactor (capacity, 200 litres) with 2-hp 3-phase motor; mild steel PVC-lined or rubber-lined reactor (capacity, 10,000 litres) with a stirrer with 2-hp 3-phase motor; forced air circulation hot air oven with thermostatic control; and granulator with SS screens and SS agitator.

CSIR SUPPORT TO RESEARCH

Glycolysis in Lung, Its Regulation and Modulation

A detailed study of glycolysis in lung and its regulation and modulation by factors that are known to influence the pulmonary functions was undertaken by Shri Tazeen Mahmood (a CSIR research fellow) under the guidance of Dr V. N. Singh at the Department of Biochemistry, Vallabh-bhai Patel Chest Institute, Delhi.

The rate of glycolysis (formation of lactate) by rat (male albino) lung slices was found to be slow during the initial period of incubation (up to 30 min.) followed by a rapid rate, which was linear up to two hours. A time-course study of respiration by the lung slices was, therefore, undertaken. It was found that there was active respiration up to 30 min. followed by a marked drop in the rate of respiratory activity. The decreased respiration after 30 min. was expected to lower the ATP formation by the tissue. The rapid rate of glycolysis by lung slices after the first 30 min. could be, therefore, attributed to a lowering of ATP level, which is known to be a potent inhibitor of phosphofructokinase in cells. It might also be considered as indicative of an operation of Pastern effect in lung during active respiration and release from this effect during the lowered rate of respiration.

Hypoxia is known to affect the rate of glycolysis in other tissues and has been shown to cause physiological and histological changes in the lung.

As there is an acid effluent in one stage of the process, an acid treatment tank is recommended. In another stage, sulphur dioxide is evolved and it should be scrubbed with alkali solution.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

To study the effect of hypoxia, animals are generally exposed to low atmospheric pressure for long durations. In the present study, however, rats were exposed to 349.2 mm of Hg pressure for a short period (6 hr) in order to study the early effects of hypoxia with minimum possible secondary effects of this condition on the glycolysis. The rate of glycolysis by rat lung slices incubated in the medium containing 5 mM glucose was not significantly affected by the short term hypoxia. However, lactate production by the lung slices from hypoxic rats was found to be enhanced when incubated in the absence of glucose. Hypoxia is known to lower the ATP level in the lung which may de-inhibit phosphofructokinase, thus stimulating glycolysis which was expected to supply the energy during hypoxia. This showed that lung possesses the ability to adapt to the alterations in the supply of oxygen by modulating its glycolytic activity.

The importance of adenosine 3',5'-monophosphate as a mediator of hormone action in a variety of tissues is well established. Cyclic AMP is known to induce relaxation of smooth muscle. Thus, the effect of DB-c-AMP on the rate of glycolysis was studied. It was found that the rate of glycolysis was enhanced by the cyclic nucleotide with or without added glucose (5 mM). The effect of DB-c-AMP and glucose was additive.

In order to find out step(s) at which the glycolytic flux was likely to be regulated and which was stimulated

by DB-c-AMP, the steady state levels of the glycolytic intermediates under normal and DB-c-AMP enhanced rate of glycolysis were estimated. The crossover plot of intermediates showed that the enhancement of glycolysis was accompanied by activation of phosphofructokinase catalyzed conversion of fructose-6-phosphate to fructose-1,6-diphosphate. This was considered indicative of stimulation of phosphofructokinase by DB-c-AMP. This also suggested that phosphofructokinase, perhaps, catalyzed a rate-limiting step in pulmonary glycolysis. This prompted a study of purification and characterization of this enzyme from the lung. The subcellular distribution of phosphofructokinase from rat and rabbit lung was studied and it was found that the enzyme activity is largely in the supernatant fraction (105,000 \times g supernatant).

PATENTS FILED

186/Del/77: "Eccemark" semi-automatic electrochemical marking machine, S. K. Basu, R. C. Bishnu & R. R. Guha—CMERI, Durgapur.

188/Del/77: Improvements in or relating to feeding of direct current for etching of aluminium foil by means of contact cell, B. A. Shenoi, R. Radhakrishnan, K. R. Narasimhan, V. Lakshminarasimhan, D. Kanagaraj & A. Perumal—CECRI, Karaikudi.

220/Del/77: An improved casing pipe for facilitating ground-water level measurements in tubewells, S. Mallick—CSIR, New Delhi.

PERSONNEL NEWS

Appointments/Promotions

The following personnel have been promoted as Scientist C at the Indian Institute of Petroleum (IIP), Dehra Dun: Shri K. M. Agrawal, Shri N. Ray and Shri B.M.L. Wadhera (9 May 1977).

Honours

Shri Baldev Singh, Chief (Technology Utilization), CSIR, has been nominated a member of the committee constituted by the Union Ministry of Industry to monitor and review the progress made in financing projects based on indigenous technology.

National Information Centre for Drugs & Pharmaceuticals

The National Information Centre for Drugs & Pharmaceuticals (NICDAP) at the Central Drug Research Institute, Lucknow, is one of the four sectoral centres set up under the National Information System for Science and Technology (NISSAT) by the Department of Science and Technology, Government of India. NICDAP would serve as a central information agency for collection, storage, retrieval and dissemination of information relating to drugs and pharmaceuticals.

The centre's activities consist of the following nine major projects: (1) Current awareness service: (a) R & D and (b) Industry; (2) Subject bibliographies; (3) Patents awareness service; (4) New drugs bulletin; (5) Registry of adverse effects of drugs; (6) Directory of information sources for drugs; (7) Survey of Indian drugs and pharmaceuticals industry; (8) Futuristic studies; and (9) Survey of information needs and evaluation of information use. Scientists and technologists in R & D organizations and industry, medical and veterinary colleges, schools of pharmacy and university departments concerned with drug research, and management executives in the central and state governments responsible for health care programmes are the expected users of these facilities/services.

At present the following services are available at the centre: Selective Dissemination of Information (SDI); Reprographic Services, which include photocopying of documents available with the centre (single copies for research purposes only); and a Referral Service.

NICDAP has started the publication of three monthly bulletins from January 1978: (1) *Drugs & Pharmaceuticals—Current Highlights (R&D)*; (2) *Drugs & Pharmaceuticals—Current Highlights (Industry)*; and (3) *Drugs*

& Pharmaceuticals—Patents Awareness Bulletin.

Drugs & Pharmaceuticals—Current Highlights (R&D): This bulletin, an article alert service, indicates articles of interest in the field of drugs and pharmaceuticals spread over 15 major areas: endocrine system, nervous system, cardiovascular system, respiratory system, gastrointestinal disorders, metabolic & degenerative disorders, infectious diseases, anti-neoplastic agents, biochemical pharmacology, molecular biology, biopharmaceutics, natural products, general, new techniques, and new reactions.

Drugs & Pharmaceuticals—Current Highlights (Industry): This bulletin highlights the latest developments in the drugs and pharmaceutical industry and includes information on new products introduced, letters of intent

issued by the Government of India, and drug regulations.

Drugs and Pharmaceuticals—Patents Awareness Bulletin: This monthly, a patents alert service, covers patents in the field of drugs and pharmaceuticals spread over the 15 major areas mentioned under *Drugs & Pharmaceuticals—Current Highlights (R & D)*.

Annual subscription rate for each bulletin is as follows: Rs 25, £ 6 or \$ 15 for individuals, teaching institutions and government laboratories, and Rs 100, £ 25 or \$ 60 for others. Single copy of each of the bulletins is priced at Rs 10, £ 1 or \$ 2.

Further details regarding these publications and other services can be had from the Scientist in charge, National Information Centre for Drugs & Pharmaceuticals, Central Drug Research Institute, Post Box 173, Lucknow 226001.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 3/78

It is proposed to appoint a Director for the National Chemical Laboratory, Poona.

This is a top R & D management position in CSIR in the chemical field. The Director should provide leadership in identification of R & D needs of chemical and allied industries. The major areas of research at NCL include: organic chemistry, including agrochemicals, organic intermediates for drugs, dyestuffs; chemical engineering and process development; chemistry of plant products; biochemistry including enzyme chemistry, fermentation; polymer science & engineering; inorganic chemistry; and solid state and physical chemistry.

Qualifications/Experience: High academic qualifications, fellowship/membership of learned scientific societies, professional bodies and extensive research and development experience in the specific branch of chemical sciences of relevance to the activities of the laboratory.

The Director is expected to be an able and creative individual in the profession, project an excellent image of the laboratory and initiate fruitful dialogues with users of R & D including industries and government agencies as well as central ministries and undertakings concerned with the promotion of industries and utilization of technology.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2500-125/2-3000. Initial pay will be fixed according to merit. It is a tenure post. The person selected will be appointed on contract for a period of six years subject to confirmation of the contract after two years of satisfactory service. Other conditions of the contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Application Procedure: There is no standard application form prescribed as such and the persons interested may obtain a standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the laboratory. Applications along with completed *curriculum vitae* proforma must reach this office on or before 28 March 1978.

Canvassing in any form and or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

VOL 28 NO 4 28 FEBRUARY 1978
A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Low Grade Heat Recovery Turbopack System

Energy conservation by utilization of either waste heat or a renewable source, such as solar energy, is becoming an urgent necessity in the modern world. With this in view, the Propulsion Division of the National Aeronautical Laboratory (NAL), Bangalore, has undertaken a feasibility demonstration towards the application of tur-

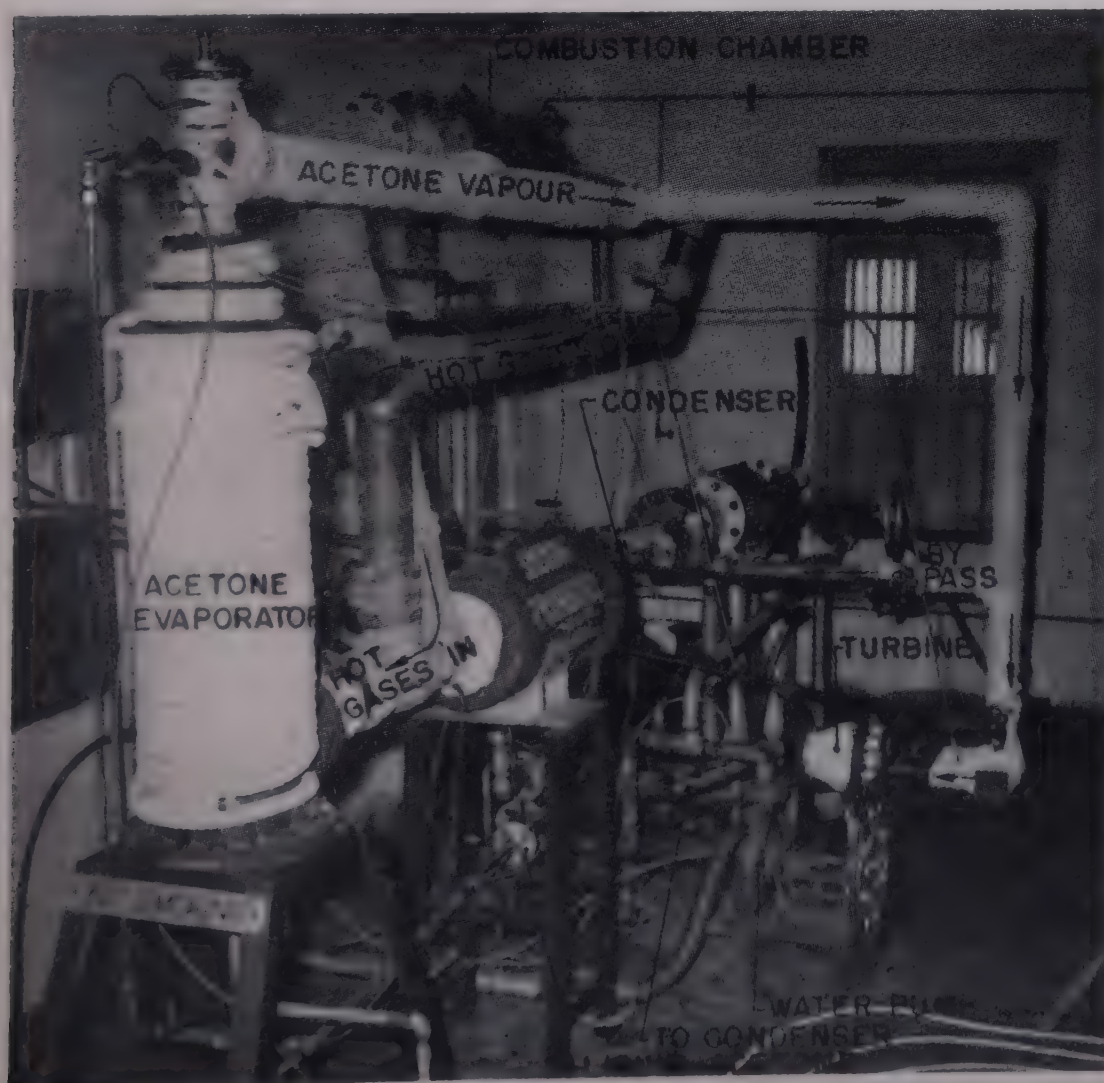
bomachinery to very small power ratings at a low turbine temperature. As a part of the activity under the UNDP-assisted project 'Establishment of Turbomachinery and Combustion Laboratory', a turbine working on acetone-based Rankine loop was designed and built to drive a conventional centrifugal pump. The whole system was constructed mostly out of the components and materials available in the laboratory, and it was commissioned

successfully within a year's time from the conceptual stage.

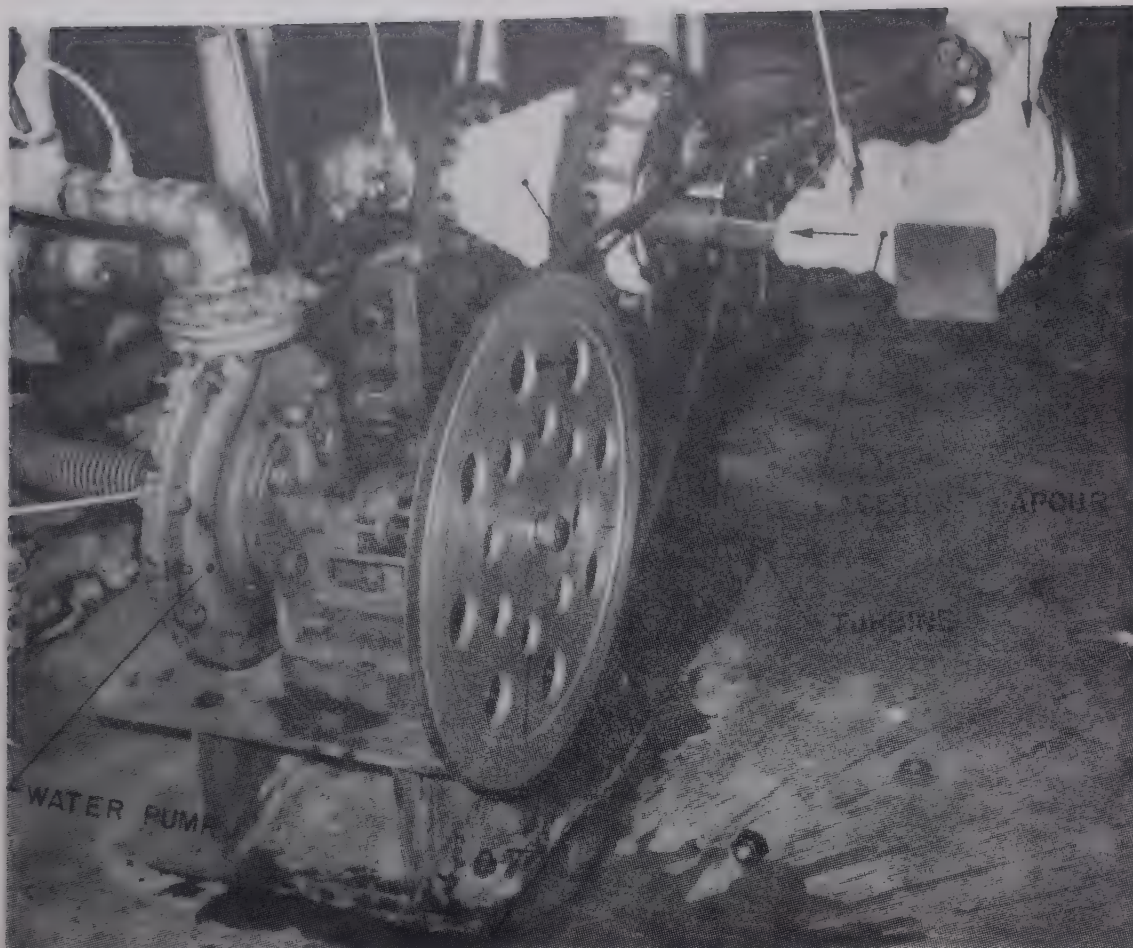
The system has been designed keeping the cost factor in the forefront. It is rated for a nominal output of 1 kW only to establish the pessimistic performance level. At higher power ratings the performance improves significantly owing to reduced percentage magnitude of mechanical losses, such as disc friction, bearing and seal losses. In the first variant of design the turbopack runs at 10,000 rpm with a turbine entry temperature of 60°C only. It drives a centrifugal pump running at 1500 rpm by means of a pulley and belt.

Acetone was found to be a suitable working fluid for the low temperature Rankine turbopack system for the following reasons : (1) it is a liquid at ambient temperature and pressure, (2) its boiling point is higher than the maximum expected ambient temperature, yet sufficiently low to utilize low temperature heat for its evaporation, (3) latent heat of evaporation is relatively low, and (4) it is non-toxic, non-corrosive and easily available in India.

The Rankine cycle was operated around atmospheric pressure to simplify shaft-sealing problem and to reduce disc friction loss at high speed. Freon 113 (trichlorotrifluoroethane) was also found to be a suitable working fluid. In fact, it has superiority over acetone in view of the disadvantageous features, such as combustibility and solvent property of acetone. However, it was decided to initiate the work with acetone since Freon 113 was not available in India.



Acetone-based Rankine loop : NAL, Bangalore



A view of turbopack system : NAL, Bangalore

The complete system of turbopack, along with the closed-circuit acetone Rankine loop, has been run at different speeds to measure its performance. On the basis of experimental results obtained hitherto, it is expected that the net efficiency of the turbopack would be about 43% and it would increase to about 59% at 6 kW power rating, when full admission is provided to the same turbine. The condensate pump of Rankine cycle absorbs less than 2% of the shaft power produced by the turbopack. The turbopack has shown excellent starting characteristics owing to high torque at zero speed. Carnot efficiency for this low temperature cycle is only 4.7%. The corresponding ideal Rankine cycle efficiency is 4.1%, while the actual thermal cycle efficiency will be 2.4% at a power level of 6 kW.

The immediate application of such a system can be found in the utilization of waste heat from industries, chemical plants and in the utilization of geothermal energy. The estimated cost of this system is Rs 15,000 per instal-

led kilowatt. If the waste heat is available in the form of hot water or steam continuously at a temperature of about 80°C and assuming 80% availability in a year and 20% of capital cost as annual charges for depreciation, interest and maintenance, such a system will produce electric energy at a cost of Re 0.50 per kW. This rate for electricity is close to the cost of electric energy from thermal plants, even at today's pricing. The economics of this system in conjunction with solar energy will be practically governed by the cost of flat-plate solar collector. The development of flat-plate solar collectors will have to be watched carefully. This system utilizing solar energy may still be a viable solution for remote rural areas.

The second variant of the turbopack has been designed to improve on the design of the first variant. The second variant will run at 3000 rpm directly driving a pump or an alternator thus eliminating belt/gearing. This design, which provides for almost hermetic

sealing of the working fluid and also drives a condensate pump impeller mounted on the same shaft, is expected to offer long life, reliability and easy maintenance even in rural areas.

A turbopack system with a low power rating of 1 kW and working on acetone-based Rankine cycle at such a low temperature is probably the first of its kind in the world.

NAL would welcome information from various parties regarding the form of waste heat, its quantity and temperature, available at their plant in order to examine the possible development of the system developed at NAL.

Foil Resistance Strain Gauges

Electrical resistance strain gauges have become a basic tool for the measurement of physical parameters like pressure, load, thrust and acceleration through the medium of appropriate transducers and also for the measurement of strain itself. These devices find application in a wide range of areas from structural and aeronautical engineering to medical research.

The National Aeronautical Laboratory (NAL), Bangalore, has developed technology for the fabrication of foil resistance strain gauges on a bench scale. The laboratory had developed in 1972 bakelite based wire strain gauges, the know-how for which has been passed on to three firms, two of whom have gone into production.

The fabrication of foil type gauges developed by NAL is basically done by using the photolithographic technique. A foil of required thickness is mounted on a bakelite or epoxy backing. A photo-sensitive solution (photoresist) is coated on this foil. The sensitive coating is then exposed to ultraviolet light through a mask of required configuration. The exposed coating is developed in a suitable developer. This process leaves the photoresist coating in selected areas as an etch-resistant coating. This sheet after etching in a suitable etchant produces a foil gauge.

The electrical strain gauges are basically of three kinds, viz. wire, foil and semiconductor type. The functioning of

these strain gauges is based on the principle of change of electrical resistance of a metal with change in its length, given by the expression $R = \rho l/a$, where R is the resistance, l denotes length, a is the area of cross-section, and ρ is the specific resistivity of a metal, which behaves as a constant during the operation of foil and wire type of gauges.

The foil resistance strain gauges produced in the laboratory are superior to the wire strain gauges. The advantages of the foil type gauges over the wire type gauges are :

(1) In the foil type gauge, configurations are unlimited, and limitation is in size, dependent on the resolution of photographic plate and the advancement of metal etching technology. In the wire type, only linear gauges can be fabricated.

(2) Large cross-sectional areas are provided to the end connections, thereby decreasing the cross sensitivity in orthogonal direction. In the wire type gauge, cross sensitivity is inherent since a piece of wire is laid orthogonally to connect two wires in the sensitive axis.

(3) Cross-section is a rectangle, giving an area contact. This increases dissipation capability manifold. In wire type gauge, there is a line contact with surface, and this limits heat dissipation.

(4) Foil used is much thinner than the diameter of wire and thus gives better representation of surface strains than wire type gauges.

The technique developed is capable of fabricating foil strain gauges with gauge lengths of 3 to 5 mm. At present, this technique is being utilized to fabricate a number of these gauges on batch production to assess their performance and economics.

The specifications of the foil type strain gauges developed by NAL are as follows :

Gauge resistance (ohm):	120	350	120
Gauge length (mm)	3	3	1.5
Backing material	bakelite or epoxy		
Operating temp.	up to 150° C		
Fatigue life	more than 10 ⁷ cycles at strain levels of ± 500 micro strains		

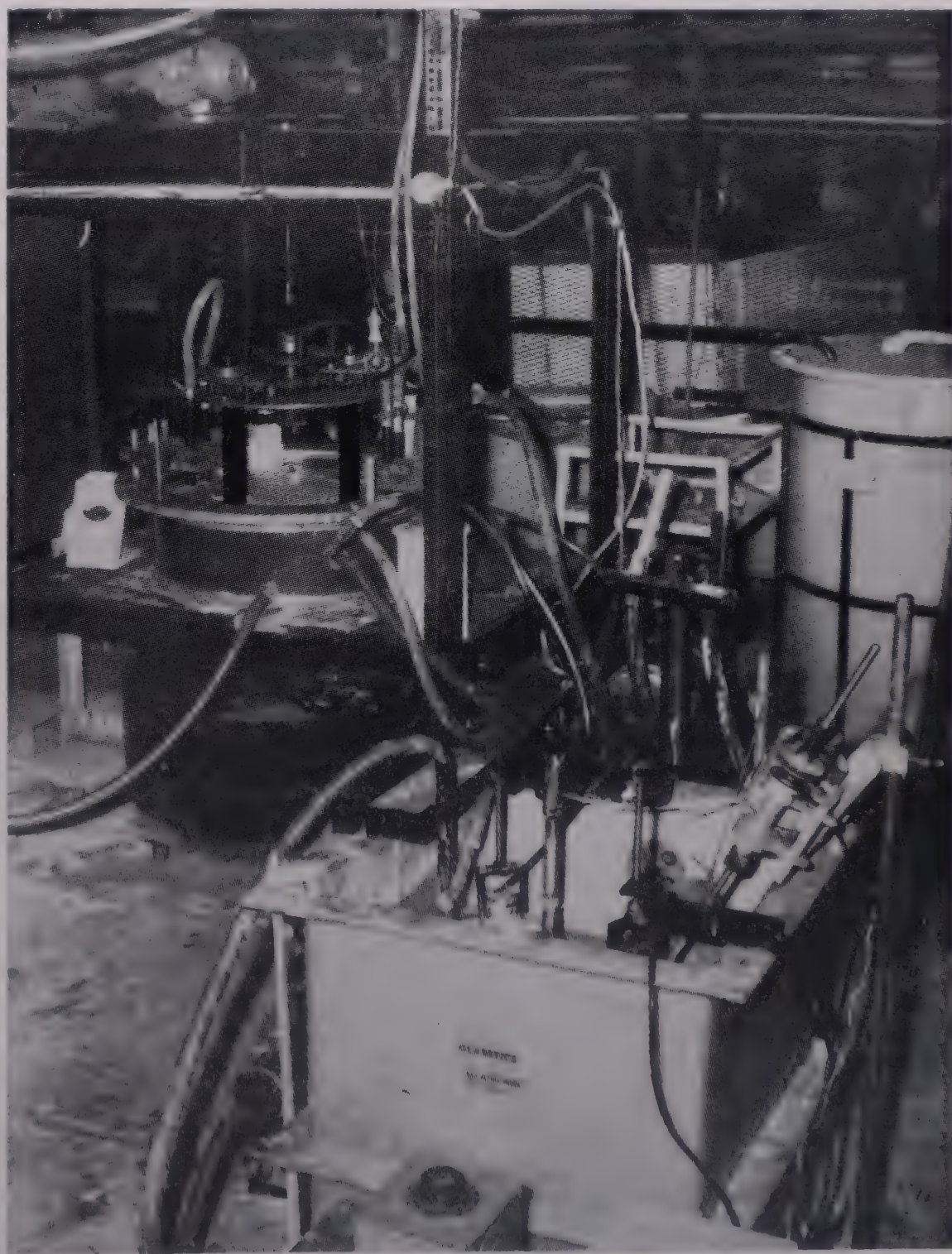
Presently only linear gauges are scheduled for production. Any other specific configurations can be handled.

Gallium Metal

A two-stage electrolytic process for recovering gallium metal of 99.9% purity from sodium aluminate liquor obtained in the bauxite digestion units of aluminium plants has been developed at the Central Electrochemical Research Institute, Karaikudi. Gallium finds application in electronics industry

through the intermetallic compounds such as Ga-As which are semiconductor materials. At present, the country's annual demand for gallium is about 100 kg, and this is being met through import only.

Laboratory-scale trials have been completed successfully in a unit capable of producing 50 g of gallium metal per day. It is proposed to set up a pilot plant (capacity, 200 g/day) at the factory site of one of the aluminium plants in India.



Gallium recovery unit (50 g/day capacity) : CECRI, Karaikudi

NRDC Awards for Inventions

Two processes/products developed by the cooperative industrial research associations of CSIR figure in the list of award-winning processes announced on this year's Republic Day by the National Research Development Corporation (NRDC) of India for meritorious inventions. Details of the awards are as follows :

(1) Shri K. Sreenivasan and Shri S. N. Govindarajan of the South India Textile Research Association (SITRA), Coimbatore, have been jointly awarded Rs 2500 for developing a 'two-for-one' twisting machine.

(2) Shri J. R. Modi and Shri S.S. Trivedi of the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad, have been jointly awarded Rs 1000 for developing cheaper chemical substitutes for citric acid and zinc acetate used in colour processing of textiles.

Two-for-One Twisting Machine

Developed at SITRA, the two-for-one twisting machine twists all types of ply yarns in textile industry. In the conventional machines used at present, one turn of twist is introduced into the yarn for every revolution of the spindle but in the two-for-one twisting machine, two turns of twist are intro-

duced for every revolution of the spindle. Imported machines based on this principle are prohibitively expensive and hence they have not been used much in India. The SITRA development makes it possible for the Indian textile industry to have an inexpensive and high-productive machine designed specially for Indian conditions. Considering that there are at present more than 15 lakh doubling spindles in the cotton textile industry alone and that these have been increasing at the rate of about 4% per annum the importance of this high-productive machine to the economy of the textile industry is obvious.

The advantages of the two-for-one twisting process are as follows :

(1) For a given spindle speed the production per spindle is double that of a ring twister. Also, the limiting spindle speeds are around 13,000 rpm and, therefore, the production per spindle on the two-for-one twisting system would be $2\frac{1}{2}$ to 3 times that of a ring twisting system.

(2) Larger yarn packages (about 1 kg) are obtained. This results in a fewer knots in the doubled yarn, which is an added advantage in further processing. Also, owing to large package produced, a lower doffing cycle results, so a lesser number of operatives are

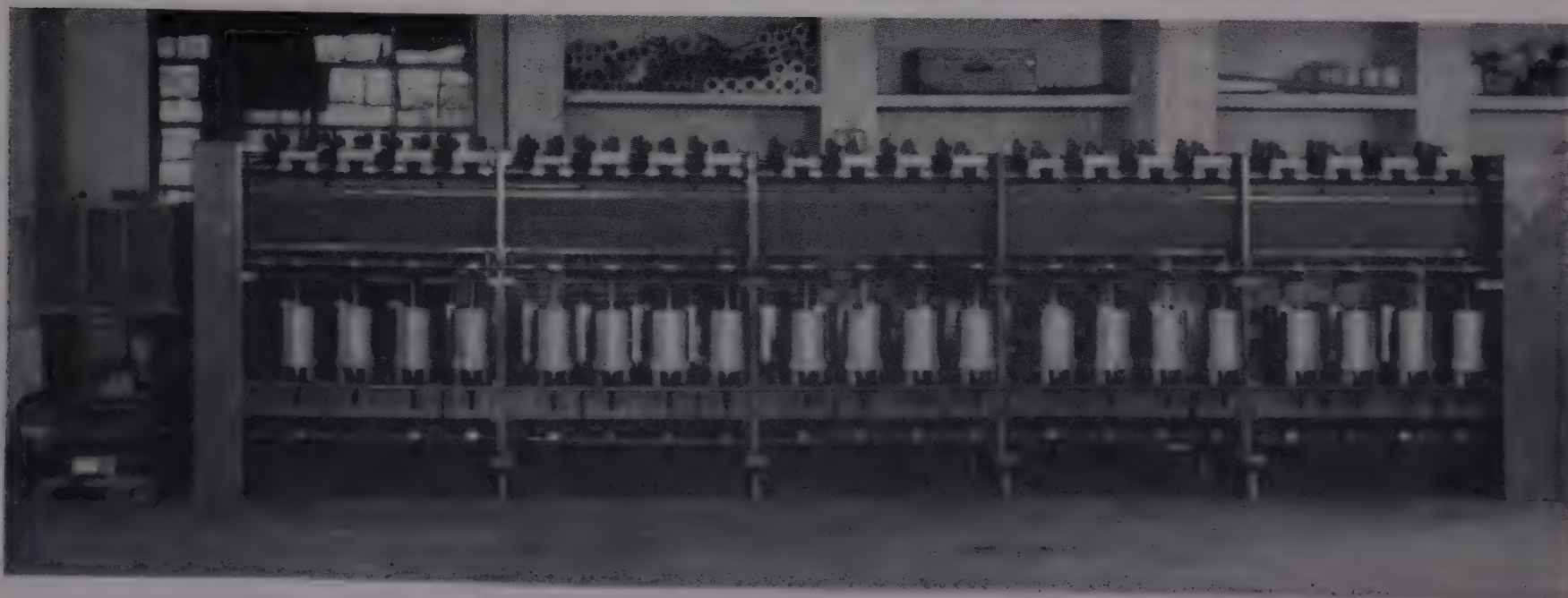
required for a given number of spindles.

(3) Rewinding is eliminated and, hence, the cost of rewinding (machines and operatives) is saved.

Cheaper Substitutes for Citric Acid and Zinc Acetate in Colour Processing of Textiles

In printing of textiles, resist style of printing under reactive dyes and under phthalogen has captured the market during the last few years. For resist under reactivities, citric acid is used as a resisting agent, whereas for resist under phthalogen, either zinc acetate alone or a combination of zinc acetate and citric acid is used as a resisting agent.

Citric acid to the tune of about 1,00,000 kg/annum is imported for various end uses. Most important among these are in pharmaceuticals, beverages and textiles. If the overall consumption in textiles can be reduced, it will be possible to make citric acid available for other industries. With a view to substituting citric acid and to reducing the cost of processing in textiles, cheaper substitutes have been developed by ATIRA. For resist under reactivities, a combination of phosphoric acid and diammonium hydrogen phosphate has been found to be efficient to replace citric acid. Similarly, for resist



Prototype of two-for-one twisting machine (40 spindles) : SITRA, Coimbatore

under phthalogen, ammonium sulphamate has been found equally efficient to replace a combination of zinc acetate and citric acid. While these substitutes produce as good or even better results than citric acid, they do not have any adverse effect on other properties of textiles. These developments are being used by many textile mills. The savings in cost of printing resists are estimated to be about 40% and 15% for resist under reactives and resist under phthalogens respectively.

Silica Gel Process Goes into Production

Based on a technology developed by the Regional Research Laboratory (RRL), Jorhat, three firms, viz. Beechams of Kanpur, Patalia Chemical Industries of Jamnagar, and Garg Chemicals of Gwalior, have started commercial production of silica gel. If the installed capacities of all these firms are fully utilized, about 150 tonnes of silica gel will be produced in the country annually.

Silica gel finds use mainly as a desiccant in industrial appliances ranging from instruments to medicine. It is also used for separation of gases in petroleum refining, as a catalyst carrier in butadiene polymerization, and in synthetic rubber industries.

Once the gel is saturated with moisture, it can be regenerated by simple drying in an oven or superheated steam. Incorporation of a colouring agent like cobalt chloride, which turns blue from purple, helps in knowing the stage of saturation of the desiccant.

The conventional method for manufacture of silica gel involves reaction between sodium silicate and acid followed by washing and dialysis to free the product from electrolytes and finally drying at 110-120 °C to obtain the final product.

The main drawback of the conventional method of manufacture is that it is very difficult to control the right degree of polymerization of silicic acid, which is very much essential to obtain the quality end product. The presence

of electrolytes complicates the system. Further, freeing the gel from electrolytes by washing or by dialysis is cumbersome and expensive. The moisture absorption capacity is only 36% at 90-95% RH.

The process developed at RRL eliminates all the above defects. The gel is of 99 + % purity and can be utilized for chromatographic and other special purposes. The water absorption capacity of the gel is 42-44% at 92-95% RH and bulk density, 0.48 kg/litre. The RRL process does not require elaborate arrangement like dialysis for removal of electrolytes and as such the operation cost for production is low. The gel is of high purity and therefore can be utilized not only as desiccant, but also for drying of gases in chromatographic analysis. The capital investment for a plant of capacity 50 tonnes/annum will be about Rs 2.78 lakh and cost of production will be about Rs 10/kg. The silica gel produced by this process compares well with high-grade silica gel which sells at Rs 45/kg.

The laboratory has recently worked out an integrated process for the production of silica gel, potassium silicate, silica sol and molecular sieve zeolites. Potassium silicate solution finds use in fixing phosphor in TV tubes and screens. Molecular sieve zeolites are used in selective separation of gases and liquid mixtures, extreme drying of gases and liquid, catalyst or catalyst support. Magnesium trisilicate is used extensively in pharmaceutical industries as antacid. Other metallic silicates, such as calcium silicate, find use as filler materials for rubber and paint industries. Following this process all these chemicals can be manufactured, depending upon the need, using the same equipment and machineries. Besides, chemicals like magnesium trisilicate and other metallic silicates can also be manufactured using silica sol. Patalia Chemicals has recently taken up the process for production of silica sol. Silica sol itself finds extensive use in paper, refractory and chemical industries.

Carbonless Copying Technology Licensed to Industry

The technology for the production of carbonless copying paper—'no carbon required' (NCR) paper—developed by the Regional Research Laboratory (RRL), Jorhat, has been licensed to Titaghur Paper Mills Co. Ltd, Calcutta. RRL, Jorhat, has developed the technology for the first time in the country and the licensee will be the first in the country to manufacture this product.

NCR paper is very popular in developed countries and although it will be a new product in the Indian market, it is expected to replace at the first instance the one-time carbon paper that is now being used in the teleprinter rolls and in computer stationery.

NCR papers or carbonless copying papers are also likely to replace the carbon inserts used with conventional uncoated paper for making multiple copies. Conventional carbon paper has several limitations and disadvantages and cannot be suitably utilized in modern business machines like electronic data processing equipment, computers, teletype and adding machines. Moreover, for business forms like credit card forms, airlines and insurance forms, tickets, invoices, purchase orders, expense accounts, pay lists, drafts and cheques, conventional carbon paper cannot be conveniently used. These carbon papers are also not completely smudge resistant. Besides, the use of carbon papers is clumsy, and removal and replacement is time-consuming. The demands for improved copying methods have, therefore, led to the development of this type of pressure-sensitive reaction-type manifold copying papers. NCR paper, with its characteristic cleanliness, attractive appearance and convenience, could, within a short span, replace more than 25% of conventional carbon papers in the European market.

The NCR paper system depends upon the use of two coated surfaces, one acting as a donor or transfer surface, and the other acting as a receiver

or acceptor surface. The transfer surface is made by coating of micro-encapsulated colourless dye intermediates, while the receiver surface is coated with a clay or a similar material which can react with the dye intermediates forming the colour. The dye intermediates are transferred to the copy sheet by rupturing the microcapsules through the pressure applied by a ball point pen or pencil, or by typing.

Workshop on R & D Management

A six-day workshop on R & D Management was organized by the Management Development Unit of the CSIR Planning Division at the Central Mining Research Station (CMRS), Dhanbad, from 30 January to 4 February 1978. The participants numbering 40 comprised deputy directors, project coordinators and project leaders of CMRS.

The main objective of the workshop was to focus attention on the importance of long-term R & D efforts in mining research. This has to be reviewed against the perspective plan of the mining industry in general and the coal industry in particular. Stress was laid on selection of R & D programmes, both long-term and short-term (mainly sponsored by the industry), and the scientific management of these projects with the aid of management tools like network schedules, monitoring and evaluation, project budgeting and costing.

The management of human resources highlighting the principles of team effectiveness and organization structure and effectiveness was discussed, and problems of performance appraisal were highlighted.

Two cases on the role and effectiveness of supporting services for R & D-like administration and materials management were also presented. A special lecture on the historical development of mining research and technologies was also arranged.

The participants, in their evaluation of the workshop, recommended high

priority areas in which R & D efforts in CMRS have to be channelized to meet the challenges posed by the mining industry.

The workshop was inaugurated by Shri C. S. Jha, Director (Technical), Bharat Caking Coal Ltd, Dhanbad.

Science Fair : VITM

The Visvesvaraya Industrial & Technological Museum (VITM), Bangalore, organized a science fair at the state level, in collaboration with the Department of State Educational Research & Training, Karnataka, from 18 to 22 January 1978. Seventy-eight schools from the four educational divisions of Karnataka, where divisional level science fairs were held during 1977, were invited to participate in the fair, which was held at the Bal Bhavan premises adjacent to VITM.

The exhibits, 232 in all, displayed at the fair covered a wide range of fields in science and technology. Some of the exhibits were on moon landing, radio broadcasting station, wind power generator, cement manufacturing plant, weaving shuttle, telephone, eye model, kidney model and stethoscope. Also arranged on the occasion were demonstration-cum-training programmes relating to hand-made paper-making, small-scale soap-making, cottage-scale match-making, and clay moulds and cast-making. A number of scholarships were sanctioned to the meritorious students. In all, about 20,000 persons visited the fair.

Deputation Briefs

Shri R.M.S. Bhargava of the National Institute of Oceanography, Goa, visited leading oceanographic research laboratories in France under the CSIR-CNRS exchange of scientists programme. During his stay from 15 September to 2 November 1977, Shri Bhargava, acquainted himself with the latest trends of research in aquaculture technique and energy transfer at different trophic levels of marine food chain, particularly at the primary production level in the sea. He also visited

the various fish and oyster farms where culture of these animals was carried out in large areas on commercial scale and also the industries where these animals were mechanically cleaned, sorted and packed for marketing. A notable feature of these projects was that the mussels and oysters coming from polluted waters were decontaminated with ozonized water before marketing.

* * *

Shri S. J. A Tirmizi of the Industrial Toxicology Research Centre, Lucknow, visited UK under WHO Programme for training in the recent techniques in information management at the College of Librarianship, Wales, Aberystwyth, during May-October 1977. Shri Tirmizi attended during July-August 1977 an eight-week International Graduate Summer School (IGSS) jointly organized by the College of Librarianship, Wales, and University of Pittsburgh School of Librarianship and Information Science, Pennsylvania (USA). The school, attended by 60 participants from 20 countries, provided an intensive teaching programme in several professional subjects of modern librarianship. Visits during IGSS were organized at the British Library Lending Division, Boston Spa, British Library Bibliographic Services Division, London, University of York Morrell Library, Central Public Library, Manchester, University of Aston Library, Birmingham, and the Blackwells Booksellers Ltd, Oxford, which provided an insight into the application of computer systems for the administration of library house-keeping procedures and in the retrieval and dissemination of scientific information. During the second phase of the training programme, Shri Tirmizi visited information centres operating at the Department of Environment, London, British Industrial and Biological Research Association (BIBRA) and MRC Toxicology Unit, both at Carshalton Surrey, Central Toxicology Laboratory, and the Pharmaceutical Division of Imperial Chemical Industries, Cheshire. Shri Tirmizi attended

a training programme for handling computerized information through terminal from bibliographic data bases of Medline/Toxline at the British Library Lending Division, Boston Spa.

He also attended the 51st annual conference of Association of Special Libraries and Information Bureau (ASLIB) at the University of Lancaster, Lancaster.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Methaqualone & Methaqualone Hydrochloride

Methaqualone is an accepted non-barbiturate sedative and is being used in pharmaceutical preparations by some drug manufacturers. Only two firms are known to have produced it in the country.

A process for the manufacture of methaqualone and methaqualone hydrochloride has been developed at the Regional Research Laboratory, Bhubaneswar. The process involves reaction of anthranilic acid or isatoic anhydride with acetic anhydride. The acetylated product is isolated and refluxed in a suitable solvent with *o*-toluidine under suitable conditions when methaqualone is formed. Methaqualone is isolated from the reaction mixture as its hydrochloride and is purified by crystallization. The free base is obtained by basification of the hydrochloride.

The process has been standardized on a scale of 1 kg/batch of methaqualone hydrochloride. A total quantity of 5 kg of product has been prepared by the laboratory.

The raw materials required in the process are: isatoic anhydride or anthranilic acid, acetic anhydride, *o*-toluidine, and hydrochloric acid. Except isatoic anhydride, all the raw materials are available indigenously.

The equipment required for the process are: 20-litre glass assemblies, filtration unit, vacuum pump, cooling water pump, tray drier, and heating mantle.

The suggested capacity of an economically viable unit is 1 tonne of the material per annum. The total outlay required to put up such a unit has

been estimated at Rs 80,000, including a fixed capital on plant of Rs 42,000, and a working capital of Rs 36,000. It is envisaged that the product could be manufactured by an existing unit producing fine chemicals and, therefore, no fixed capital will be necessary for land and building (80 m² approx.). The cost of product has been worked out at Rs 137/kg.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS FILED

195/Del/77: Improvements in the process for manufacture of copper ruby glass articles, S.N. Prasad, S. Sensarma & S.K. Gupta—CGCRI, Calcutta.

199/Del/77: Driving cycle analyzer, H.O. Misra, P.D. Sharma, S.V. Verma & K.K. Gandhi—IIP, Dehra Dun.

200/Del/77: Improvements in or relating to the pretreatment and formation of a corrosion resistant black and shining coating from an alkaline bath, K.S. Raja Gopalan, S. N. Guruviah, (Mrs) V. Subramanian, V. Chandrasekaran & (Mrs) V. Ramakrishnan—CECRI, Karaikudi.

205/Del/77: Improvement in or relating to post-treatment process for the removal of chloride from etched aluminium foil for use in aluminium electrolytic capacitor, B. A. Sheno, K.R. Narasimhan, V.L. Narasimhan, D. Kanagaraj & A. Perumal—CECRI, Karaikudi.

207/Del/77: Preparation of ammonium vanadate from vanadium-bearing sludge of alumina plant by liquid ion

exchange method, J. Muralidhar, R.S. Thakur, B. Mohanty & B.R. Sant—RRL, Bhubaneswar.

221/Del/77: A process for two-step drawing polyester filament tow, H.C. Bhatia, J.S. Rawat, R. Kumar & M.R. Maji—SRIFIR, Delhi.

495/Del/77: Improved process for the preparation of urea nitrate, S. Mahapatra, S. N. Das & P. K. Palit—RRL, Bhubaneswar.

334/Del/77: A domestic stove. P. N. Bhambi & A. L. Arora—IIP, Dehra Dun.

9/Del/77: A process for the production of a new coumarin having spasmolytic properties, from aerial parts of the plant *Clausena pentaphylla* (Roxb.) DC, A. Shueb, R. S. Kapil, S. P. Popli, G. K. Patnaik & B. N. Dhawan—CDRI, Lucknow.

197/Del/77: Modifications and/or improvements in or relating to hydraulic prop, R. Gupta & Bhagwant Singh—CMRS, Dhanbad.

210/Del/77: A process for the manufacture of "Latoblocks" building blocks, from lateritic soils, G. S. Ramaswamy, B. V. Subrahmanyam, N. P. Rajamane & N. Balasubramanian—SERC, Madras.

228/Del/77: A composite device for the measurement of differential settlement, tilt and crack width of buildings or such other civil engineering structures, T. K. Natarajan, R. K. Bhandari, B. Malhotra, K. Singh & S. S. Rup—CRRI, New Delhi.

239/Del/77: A process for making austenitic stainless steel containing chromium, nickel, copper and manganese, S. S. Bhatnagar, B. K. Guha & R. K. Sinha—NML, Jamshedpur.

268/Del/77: Improvements in or relating to a process for the preparation of ammonium vanadate from leach liquors of vanadium bearing titaniferous magnetites obtained by their salt roasting and water leaching through solvent extraction techniques, P. V. R. Bhaskara Sarma, P. K. Rao & P. K. Jena—RRL, Bhubaneswar.

269/Del/77: A process for the preparation of vanadium pentoxide from

vanadium bearing sludge of alumina industry, J. Muralidhar, R. S. Thakur, B. Mohanty & B. R. Sant—RRL, Bhubaneswar.

270/Del/77 : Improvements in or relating to a process for the extraction of copper from solutions using solvent extraction technique. P. V. R. Bhaskara Sarma, P. K. Rao & P. K. Jena—RRL, Bhubaneswar.

271/Del/77 : Improvements in or relating to a process for the separation of copper, zinc and iron from solutions by solvent extraction technique, P. V. R. Bhaskara Sarma, K. S. Rao, P. K. Rao & P. K. Jena—RRL, Bhubaneswar.

325/Del/77 : A process for the preparation of inorganic green pigment, T. P. Prasad, A. Suryanarayana & B. R. Sant—RRL, Bhubaneswar.

332/Del/77 : Improvements in or relating to an electronic flow meter, T. K. Sivasdas—NIO, Goa.

374/Del/77 : A process for preparation of tertiary alkyl esters from the corresponding halides, S. Anandaraman, K. N. Gurudutt, C. P. Natarajan & B. Ravindranath—CFTRI, Mysore.

PERSONNEL NEWS

Appointments/Promotions

Dr V. P. Pandya

Dr V. P. Pandya has been appointed on promotion as Scientist E at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, with effect from 15 September 1977.

Dr Pandya (born 5 June 1932) was educated in the Gujarat University (B. Sc., 1953; M. Sc., 1956; and Ph.D., 1970). Dr Pandya joined CSMCRI in April 1958 and worked in reverse osmosis. He has worked in the Chemical Engineering Division, principally on silicates, and has developed several processes for manufacture of synthetic silicates. Some of the processes developed by Dr Pandya relate to : manufacture of hydrated calcium silicates,

precipitated silica, molecular sieves, filter aid and thermal insulation. The process for the manufacture of hydrated calcium silicate won an Inventions Promotion Board award in 1967. Dr Pandya has taken one patent, and has published 19 research papers, 1 review paper, 2 project reports, and 5 technical reports. He is a recognized guide of Saurashtra University, and 5 students are now working for their Ph. D. under his guidance.

Dr Pandya visited UK under the CSIR-British Council Exchange of Scientists Programme to study the latest developments in membrane and silicate technology.

Dr Pandya is now Discipline Coordinator in CSMCRI.

* * *

The following personnel have been appointed/promoted at the Central Salt & Marine Chemicals Research Institute, Bhavnagar: Shri V. J. Shah (as Scientist C; 15 Sep. 1977); Shri Mahabala (as Scientist B; 15 Sep. 1977); Dr (Miss) B. J. Mehta (as Scientist B; 15 Sep. 1977); and Dr M. H. Vyas (as Scientist B; 15 Sep. 1977).

* * *

The following have joined, as Pool Officers, the National Chemical Laboratory, Poona: Dr Dinesh Chand Goel (8 Dec. 1977); Dr H. S. Shankar (12 Dec. 1977); and Dr (Mrs) Sathy Chandrasekhar (29 Dec. 1977).

* * *

Shri M. J. Shukla of the Indian Institute of Petroleum, Dehra Dun, has been promoted as Section Officer (9 Jan. 1978).

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

Advertisement

Applications are invited for the following appointments to implement the project for a research development and test facility for heavy electrical industry in western India, with head office at Bombay being set up by the electrical industry in cooperation with CSIR and state governments.

Planning & Coordination Officer

Functions : (1) To remain in touch with the electrical industry and to coordinate the requirements of various units for research development and test with the assistance of existing facilities at IITs, other industrial establishments, etc. (2) To assist the Director generally in the establishment of the ERDA's laboratory including planning, facilities and equipment, staff, etc.

Qualifications : Preferably a Ph.D. in electrical engineering with responsible work experience as above for at least five years.

Preferred age : 40 years.

Engineers (Planning)

Initially one appointment each in the fields of (1) raw materials, (2) standards, and (3) electrical product testing.

Functions : To assist the Planning & Coordination Officer in detailed planning and establishment of the work of each of the three divisions and rendering assistance to industry. The candidate is likely to be eventually appointed in-charge of the respective group.

Qualifications : Postgraduate degree, preferably a doctorate in materials science for post (1) and in electrical engineering for posts (2) and (3).

Preferred age : 35 years.

Secretary/Administrative Officer

Functions : To assist the Director regarding establishment of the pattern of administration and working rules for the day-to-day working of ERDA. To supervise budgeting, accounts and personnel matters. To assist the Director in formulating procedures for acceptance of test work and sponsored work programmes at ERDA.

Qualifications : Candidate should have a degree in law or commerce with adequate experience of management of a scientific or technical organization.

Preferred age : 40 years.

Accountant

Functions : Preparation of budget for the working of the laboratory and supervision of maintenance of accounts including accounts for materials.

Qualifications : Degree in commerce, preferably also a Chartered Accountant.

Preferred age : 35 years.

The above appointments will carry satisfactory emoluments related to job responsibilities as also experience and proven abilities of the candidates selected for appointment. Applications with complete *curriculum vitae*, salary drawn and expected as also the names of two referees are to be sent to : The Director, Electrical Research & Development Association, 501 Kakad Chambers, 132 Dr Annie Besant Road, Worli, Bombay 400 018.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Textile Technology Conference : ATIRA, BTRA & SITRA

The 19th technological conference, organized jointly by the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad, the Bombay Textile Research Association (BTRA), Bombay, and the South India Textile Research Association (SITRA), Coimbatore, was held on 10-11 February 1978 at ATIRA. The conference was inaugurated by Shri H. M. Patel, Finance Minister, Government of India.

In his inaugural address, Shri Patel congratulated ATIRA for its pioneering efforts and valuable work that it had been doing since its inception. He suggested several topics for the research associations to act upon. They could help the industry, for example, in utilizing the several long-staple varieties of cotton being grown in India so that the country could enter the export market in the fine and superfine varieties of fabric as well. The research associations could play a part in reducing the cost of production and improving the efficiency of both spindles and looms. They could also guide the government as to what extent it would be advisable to produce multifibres. Several factors such as cost and durability would have to be considered. More technological efforts should be directed towards improving the efficiency of cottage industries since increasing employment with due regard to the quality of production was the uppermost objective of the government, the minister added.

Shri Navnitlal Shodhan, Chairman, Council of Administration, ATIRA, in his introductory remarks, referred to the close association of ATIRA and its sister textile research associations with the user industry. Mills were increasingly depending on ATIRA for consultation, and sponsored research in several areas where specialized scientific and technical competence has been built up. ATIRA had made contributions in increasing productivity, quality improvement, cost reduction, development of import substitutes and technological self-reliance. Shorter bleaching processes have been developed. The design of non-automatic looms has been modified to permit higher speeds. Substantial savings in the consumption of cotton, chemicals, fuel and water have been made possible. A large number of instruments for testing and process control have been devised which were as reliable as imported ones but substantially cheaper. Shri Shodhan said that the industry shared with the government concern for rapid rural economic development.

Welcoming the delegates, Dr P. C. Mehta, Director of ATIRA, said that the large response from the industry to the conference was a clear sign that the conference was fulfilling its objective of providing effective communication between researchers and users. He was confident that research laboratories would be able to direct the research programmes to rural economic development and abolition of poverty,

which are the major policy objectives of the government.

There were thirteen technical sessions dealing with fibre science, spinning, fabric manufacture, chemical finishes and topics of general interest. In all, 27 papers were presented.

The papers on spinning concentrated on means to improve yarn quality and spindle productivity. It has been possible to obtain better cottons in terms of less seed-coat generation by using roller gins in place of saw gins and to show how shorter blow room sequences can be used with advantage. The higher seed-coat generation may be attributed to bad ginning conditions. There is a possibility of reducing end breakages at ring spinning by resorting to higher licker-in and cylinder speeds in semi-high production cards. There is no sacrifice in terms of physical properties of the resultant yarn. Significant improvements in cleaning efficiency and yarn quality, comparable to those of tandem cards, have been obtained by simple and inexpensive modifications of the existing cards, resulting in double carding. In respect of hook removal, the feed consisting of a crowding into the drafting zone together with alternate positioning of slivers with majority leading and trailing hooks has been shown to be advantageous.

Increased spindle speeds to the extent of 15 to 20% have been possible for polyester and its blends by proper pre-ring frame draft distribution and minor modifications of the geometry of contact points. Parameters responsible for 'wear' in rings and travellers have been identified. Epoxy

resin based adhesives like Araldite for fixing roller cots have been shown to give a significant reduction in cot slippage.

Papers on various basic techniques of measurement of loom parameters and designing of machine parts and a study of the parameters of finished fabric were presented in sessions on weaving. The measurement and design techniques have been shown to be helpful in obtaining 10 to 20% higher speeds in plain looms. A study of the hairiness of yarn collected from ring bobbin to the fabric stage has shown that the abrasive action of the loom affects the incidence of longer fibres only. Mercerized single yarn is seen to be profitably usable in place of doubled yarn for knitting without much loss in desirable properties. A useful formula in terms of warp and weft parameters for fabric design problems in the case of certain types of fabric has been demonstrated. It has been shown that by an appropriate choice of cotton variety, yarn parameters and resin formulation, even the reverse blended fabrics have properties comparable to those of the conventional ones.

The sessions on wet processing and chemical finishes dealt with a basic understanding of the chemistry of dyeing and of some special chemical finishes. A simple method of analyzing the steaming condition has been proposed for a basic understanding of unsatisfactory prints. A thermistor probe has been devised to record the temperature history of the batch in the high pressure steamer. With this probe, it has been noticed that the variations in temperature from top, middle and bottom portions are large. Suggestions have been made to minimize these variations so as to get uniform temperature and uniform print fixation. Satisfactory dyeing seems to be possible by the use of saturated or superheated high pressure steam for fixing disperse dyes. A poly-set process has been proposed for improving durable press characteristics of cotton without much loss of strength. Treatment of all-cotton and 35/65 cotton/polyester blends has

shown that at wash-and-wear level the blended fabrics possess slightly better score than the all-cotton ones and that at durable press level both are comparable. Attempts to minimize the formaldehyde release by altering finishing agent, catalyst, additives and by after-treatments were reported in a paper. An organophosphorus compound along with other nitrogenous compounds has been studied for flame retardancy. The soil removal behaviour of resin-treated cotton poplin has been reported.

The sessions on fibre science started with reports on attempts to understand frictional behaviour of fibre assemblies. The cross-sectional shape of raw cotton has been found to be highly correlated to characters such as staple length and fineness. Partial decrystallization of cotton has been proposed for texturizing cotton.

The general session dealt with topics of techno-economic and operational research value. Some techno-economic considerations for choice of boilers were given. A method has been proposed for optimizing value realization in cloth cutting. A mathematical method for representing yarn inter-lacements comparable to the common musical notation was presented.

Project on Seaweeds at CSMCRI

Under All India Coordinated Project on Algae, a multi-institutional project sponsored by the Department of Science and Technology, the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, is carrying out, for the last two years, research on seaweeds. The main aspects that are being covered at CSMCRI are seaweeds as source of energy, as liquid fertilizer and as supplementary to poultry feed.

CSMCRI has isolated a bacterial strain, typed as A₁, which can bring about quick decomposition of the polysaccharides present in the seaweed. By supplementing a small amount of another seaweed to *Sargassum* to which the specific bacterial strain is added, an increase of over 60% in biogas pro-

duction was recorded. It was decided to exploit the process by introducing seaweed biogas plants in the coastal regions as a constituent of rural development.

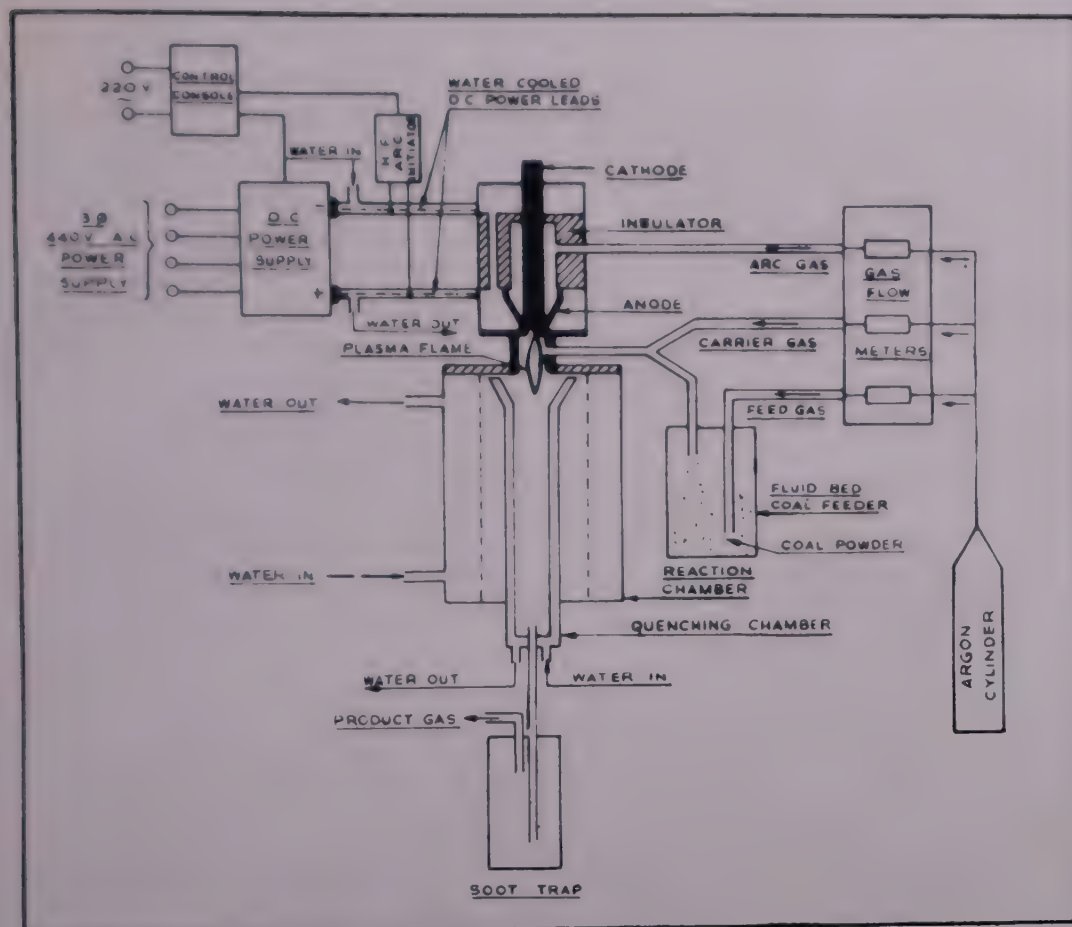
The other aspect of work is concerned with the preparation of seaweed concentrates as a soluble powder. Though the soluble powder contains a small amount of major plant nutrients (nitrogen, phosphorus and potassium), its main constituents are trace elements which are known to be important for plant growth. This soluble non-fibrous content of the seaweed makes balanced and easily absorbable liquid fertilizer. It is totally non-toxic.

Antibiotic from Seaweeds

The Central Salt & Marine Chemicals Research Institute, Bhavnagar, has isolated an antibiotic from seaweeds available along Saurashtra coast. This has been tested at Shri K. J. Mehta T. B. Hospital, Amargadh, against *Mycobacterium tuberculosis* obtained from patients admitted to the hospital. The antibiotic has been found to be highly effective against not only the normal bacteria causing tuberculosis, but also completely effective in controlling atypical bacteria responsible for chronic T. B. disease.

Chemicals from Coal by Plasma Technique

The Central Fuel Research Institute (CFRI), Dhanbad, has been studying new techniques for retrieving important chemicals, like acetylene and hydrogen cyanide, from coal. One of the techniques engaging the attention of CFRI is the plasma technique. This is essentially a highly ionized gaseous system which is conducting but neutral in itself. A jet plasma is produced by the striking of an arc between two electrodes. When treated at such a high temperature, coal yields mainly gases (besides soot and some partially graphitized coal) containing acetylene and traces of methane, ethane, hydrogen cyanide, etc., thus offering a direct method of converting coal into



Flow diagram of plasma jet system with reactor : CFRI

acetylene, a chemical widely used as a raw material in industry.

The equipment for studying the plasma phenomenon was fabricated in collaboration with the Bhabha Atomic Research Centre, Trombay, and based on indigenous expertise and know-how, which included arrangement for convenient adjustment of torch head, CFRI started operating the unit in an inert atmosphere at moderate power input in the range 6-10 kW. A large number of representative samples of powdered coal from selected coalfields of India were injected into the flame through a fluidizer, and the reaction products were subjected to immediate quenching. The tests were conducted under different reaction conditions to optimize the yield of acetylene which depended predominantly on coal rank, particularly volatile matter, particle size, quenching time, coal and gas feed rate, and mineral matter content of coal.

The yield of acetylene rose sharply with volatile matter content. The effect of particle size was not clear. Neither very fine nor coarser sizes contributed

to efficient reaction. Highly coking coals posed an inherent difficulty in operation as graphitized crust was easily formed, which choked the plasma system and made the flame unstable. Hence, high volatile non-coking coals presented the most dependable and useful raw material for production of chemicals by plasma technique.

For scaling up the process, CFRI team is working on a specially designed plasma unit as conceived on superimposed jets and a magnetically rotated arc capable of giving a broader plasma flame, which would help explore new avenues of using plasma technique in retrieving fine chemicals from coals on a commercial basis.

NIO Completes Survey of Oil Pipeline Routes from Bassein to Gujarat

The research vessel *Gaveshani* of the National Institute of Oceanography (NIO), Goa, has returned to Goa after completing the first phase of the survey of the new submarine pipeline routes from the Bassein oilfield to Gujarat. The vessel surveyed ten diffe-

rent lines on four alternative routes from the Bassein oilfield to the coast extending from Tarapur-Nawapur to Hajira.

The surveys were conducted at the request of the Oil & Natural Gas Commission (ONGC) and comprised extensive oceanographic work. The scientists of NIO's regional centre at Bombay concurrently started work on the possible shore approaches for the pipeline off the Gujarat coast. They are carrying out extensive studies on daily variations in tides, currents, temperature and chemistry of water.

A report will be submitted to ONGC to enable it and its consultants to work out the techno-economic feasibility of the pipeline routes.

Training Course in Corrosion Prevention

A one-week training course on corrosion and its control in boilers, turbines and heat exchangers, sponsored by Bharat Heavy Electricals Ltd (BHEL), for their staff, was held at the Central Electrochemical Research Institute (CECRI), Karaikudi, from 17 January 1978. Fifteen engineers and executives from various BHEL units participated in this course, which covered broadly corrosion problems faced or likely to be faced by the units, as also methods of prevention. The entire course was covered by twenty lectures given by the senior scientists and engineers of CECRI, and demonstration and discussion sessions.

Deputation Briefs

Dr Akhtar Husain, Director, Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, visited Egypt, Syria, Iraq and Sudan from 19 September to 20 November 1977, as an expert on medicinal plants, on deputation under the United Nations Industrial Development Organisation (UNIDO) programme. The purpose of his visit was to valorize the available natural resources, such as medicinal plants, for production of pharmaceuticals in the Arab countries in co-operation with the Ministry of Agri-

culture and the Arab Company for Drugs and Medical Appliances (ACDIMA), Egypt.

The original job entailed only suggesting technology for processing of medicinal plants, based as it was on an erroneous impression that necessary raw material was available in the Arab countries. A preliminary survey by Dr Husain indicated, however, that the raw material for most of the important medicines from plants was not available. He, therefore, discussed the matter with Dr A. M. Sallam, Chairman of ACDIMA, and on his suggestion, it was decided to make a project for production of the raw materials in addition to their processing. During the period of his deputation Dr Husain studied the problem with respect to the quantity and quality of basic raw materials available in different Arab countries, the status of research and development, prevailing agroclimatic conditions in various states, state of existing phytochemical industry, requirement of the Arab countries and availability of machinery for processing of medicinal plants. Based on these studies, he presented to UNIDO a comprehensive production plan including profiles and feasibility reports for the Arab pharmaceutical industry in selected Arab countries.

* * *

Dr (Mrs) S. V. Chandra of the Industrial Toxicology Research Centre, Lucknow, was deputed to USA under a WHO programme for a period of ten weeks during September-December 1977 to work on the problems of metal toxicity in the Department of Laboratory Medicine, Connecticut Medical School, Farmington. Dr (Mrs) Chandra conducted preliminary studies on the estimation of nickel contents in red and white blood cells, platelets and plasma of healthy human volunteers, in collaboration with Prof. F. W. Sunderman (Jr), Director of the Department. The results showed that normal platelets and leucocytes did not contain nickel, and hence may be of significance in the context of the increased nickel contents

in blood of patients with myocardial infarction.

* * *

Dr R. S. Kapil of the Central Drug Research Institute (CDRI), Lucknow, visited Institut de Chimie des Substances Naturelles, Gif-sur-Yvette (3 Nov. to 10 Dec. 1977) and Institut de Chimie, Universite Louis-Pasteur, Strasbourg, France (11 to 17 Dec. 1977), under the exchange programme with CNRS. He delivered lectures and had discussions on different aspects of chemistry of natural products, including their structure, synthesis and biosynthesis, with Prof. D.H.R. Barton, Prof. E. Lederer, Prof. P. Potier, Prof. (Mme) J. Polonsky, Dr B. C. Das and Prof. G. Ourisson.

On invitation from Prof. Fuganti and Prof. P. Pachaly he later visited Istituto di Chimica, Politecnico di Milano, Italy, and Pharmazeutisches Institut der Universitat, Bonn, West Germany, respectively (18 to 23 Dec. 1977) and delivered lectures on alkaloid biosynthesis. In West Germany, Dr Kapil also visited Organisch-chemisches Institut der Universitat and Max Planck Institut für Medizinische Forschung Abteilung Organische Chemie, Heidelberg.

Dr Kapil also visited, during 5-16 Jan. 1978, the universities of Cambridge, Wales, Manchester and Liverpool in UK and had discussions and meetings with Prof. A. R. Battersby, Prof. A. H. Jackson, Dr R. T. Brown and Prof. C. W. Ress.

* * *

Under the Exchange Programme with the Polish Academy of Sciences, Warsaw (Poland), Shri S. Nagarajan of the Publications & Information Directorate (PID), New Delhi, visited Poland to study the methodology adopted for dissemination of scientific and technological information in different institutions in that country. During his stay in Poland from 17 November to 31 December 1977, Shri Nagarajan visited about 40 institutions and acquainted himself with the different modes of scientific information activity. Information potential and distribution of

work of institutions visited by Shri Nagarajan may be broadly grouped as (1) industrial information system, (2) agricultural information system, (3) medical information system, (4) social sciences information system, and (5) science of sciences information system. Among the institutions visited by him are the Scientific Information Centre (OIN-PAN), Reprographic Laboratory, Computation Centre, Institute for Scientific, Technical and Economic Information (IINTE), Central Medical Library, Central Agricultural Library and Information Centre, Agricultural University (Department of Medicinal Plants), National Centre for Scientific, Technical and Economic Information (CINTE)—all located at Warsaw; Technical University, Scientific Information Centre, and Institute of Medicinal Plants at Poznan; Technical University at Wroclaw; and the Scientific Information Centre at Krakow.

The Polish Academy of Sciences, which is the apex body for all these institutions, has planned and programmed the dissemination activity in such a way that there is no duplication of effort and that the available resources are spent usefully and in an organized manner. Due recognition and importance have been given at the highest level for scientific information activity in national interest.

Herbaceous Flora of Dehra Dun

This is the eleventh in the series of botanical monographs published by the Publications & Information Directorate, New Delhi.

Compiled by Dr C. R. Babu of the Department of Botany, University of Delhi, the Flora, first of its kind, presents taxonomical and ecological information on 1230 species, belonging to 624 genera under 115 families of herbaceous and subwoody plants of Dehra Dun and serves as a reference system for the herbaceous plants of the whole of North-West Sub-Himalayan tracts. The introductory chapters deal

with the geographical features, topography, geology and soil, climate, previous explorations and phytography, and effect of biotic factors in this area.

For each family, information is given on: (i) number of genera and species in the world; (ii) range of distribution; (iii) chief types of habit and habitat, if specialized; (iv) number of genera and species in India (including Sikkim, Bhutan and Nepal); and (v) distribution within India. Wherever necessary, a brief taxonomical and/or nomenclatural note is provided and the major economic importance is mentioned. Similar information is also provided for each genus. The information on each species includes: (i) latest correct name according to the International Code of Botanical Nomenclature with full reference to author(s), basionym, if any, and important synonyms; (ii) concise and diagnostic description; (iii) habitat range, flowering and fruiting seasons, abundance, and citation of specimens along with locality, collector's name and number of collection; and (iv) taxonomic affinities, phenotypic variability of populations, if any, and nomenclatural notes and suggestions (wherever necessary) on taxonomically difficult species.

Essentially a reference text, the Flora would be useful to university students, foresters, agricultural scientists, naturalists, environmental biologists, and others interested in modern systematics. Plant management agencies should equally find the Flora a useful compendium.

The publication (pp. vii+721, royal 8vo) is priced at Rs 144 or \$60 or £22, and can be had from: The Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

PROGRESS REPORTS

NEERI Annual Report : 1976

The National Environmental Engineering Research Institute (NEERI), Nagpur, has brought out its annual report for 1976. The report shows that the institute carried out investigation on

145 projects, of which 30 were sponsored and eight were under collaborative schemes. The institute completed 20 short- and long-term consultancy assignments. About 30 assignments were in progress.

The United Nations Environmental Programme (UNEP) sponsored a project entitled 'Identification and preparation of an inventory of institutions in the ESCAP region with capabilities of assessment for air and water pollution' with NEERI as the project coordinator under CSIR. On behalf of UNEP, some NEERI scientists visited the countries in the ESCAP region including Bangladesh, Indonesia, Philippines, Malaysia, Singapore and Sri Lanka, where they collected comprehensive information on the facilities and capabilities available with organizations in the respective countries with regard to air and water pollution monitoring work. As a WHO collaborating centre on community water supply, waste disposal and air pollution, the institute continued to furnish data on items of mutual interest to WHO international reference centres round the world. Another zonal laboratory of NEERI—ninth so far—was opened at Kalamassery, near Cochin, in June 1976.

Steady progress was made in the application of reverse osmosis for treating high-salinity water. An experimental reverse osmosis assembly of five tubular membranes was fabricated at the institute so as to give 5 m³/day product water with a permissible salinity of 600 ppm at 42 kg/cm² as operating pressure.

At the request of the Andhra Pradesh Government, an extension programme was carried out in rural areas of the state to demonstrate the Nalgonda technique for defluoridation of water. The rural population was provided with sufficient quantity of chemicals to practise this technique for a year using the domestic utensils available with them. The Andhra Pradesh Government also took steps to install a 5,00,000 gal./day plant (2272 m³/day)

at Kadiri township for defluoridation of water.

NEERI's process for the manufacture of chlorine tablets and chlorine ampoules was released through the National Research Development Corporation of India to four entrepreneurs who started production. These items are being used for disinfection of water.

Data on common air pollutants, viz. suspended particulates and sulphur dioxide, were collected as a part of the long-term national air pollution monitoring programme being carried out by the institute. The ten cities chosen for studying air quality monitoring were Ahmedabad, Bangalore, Bombay, Delhi, Calcutta, Hyderabad, Jaipur, Kanpur, Madras and Nagpur.

The institute is collaborating in the All-India Coordinated Project on Algae sponsored by the Department of Science and Technology. Studies are in progress for the development of a biotic index which will help establish the community structure for biological monitoring of water quality in terms of organic pollution. Studies are also in progress on the utilization of waste waters for fish culture. The species of fish which have been cultured include common carp and cat fish.

Under a 10-month survey, the emissions from a fertilizer plant, refineries, power stations and petrochemical industries located in the Chembur-Trombay area near Bombay were studied. The ambient air quality and wind pattern in the region were determined at five monitoring stations. A feasibility plan for abatement of air pollution in a phased manner for different types of sources in the area will be enumerated in a project report. The project was sponsored by the Prevention of Water Pollution Board of the Maharashtra Government.

Under a project sponsored by the National Industrial Development Corporation, New Delhi, investigations on the removal of colour from pulp and paper mill wastes of the Nagaland Paper Project at Tulu were completed. Laboratory studies indicated that

colour could be reduced by 90% in combined waste water. Based on these studies, flowsheets for treating 7100 m³/day of combined waste water for colour removal were prepared.

The Kanpur zonal laboratory has developed a cheaper and efficient method for the treatment of vegetable tanning wastes.

A two-year study on the performance of the activated sludge treatment plant at Dadar, Bombay, revealed that 41-83% virus removal could be effected in the primary settling tanks. An evaluation of the efficiency of the primary sedimentation tank for the removal of enteric viruses under different flow rates, detention times, suspended solids and surface loadings, showed that the average removal of viruses ranged between 41 and 59% during July 1974 to May 1975 and between 40 and 82% during April 1976 to December 1976.

Significant data have been collected on use of saline water in agriculture. This is a part of the ICAR coordinated scheme for research on the use of saline water in agriculture. Higher crop yields have been obtained using diluted sewage in certain proportions.

The feasibility of employing, on a mass scale, a biological control of mosquitoes was being studied by using *Utricularia*, an aquatic carnivorous plant commonly found in quiescent waters. These plants were found to trap and kill mosquito larvae and it seemed to be a promising method for effective control of propagation of mosquitoes.

NEERI has acquired adequate technical competence on solid wastes management. The institute prepared a project report for setting up a mechanical composting plant at Gauhati. Investigations have also been completed for studying the feasibility of carrying out mechanical composting of refuse for the cities of Jabalpur and Kota.

Five training courses, specially designed to equip technical personnel in the field, were conducted by the

institute as part of its effort to promote transfer of technology. A special refresher course sponsored by NEERI and the Central Board for Prevention & Control of Water Pollution, New Delhi, was organized at Nagpur for the chairmen and member-secretaries of Water Pollution Control Boards during November 1976 to equip them for the implementation of the Water Preven-

CSIR SUPPORT TO RESEARCH

Completed Schemes

Immunology of Leprosy

Studies relating to immunotherapy in experimental leprosy and histocompatibility antigens in leprosy were carried out by Dr N. K. Mehra (a CSIR research fellow) under the guidance of Dr M.C. Vaidya at the Department of Anatomy, All India Institute of Medical Sciences, New Delhi.

Studies on the role of T and B lymphocytes with a view to evaluating immunotherapy in leprosy have indicated that the transfer of T and B cells individually fails to restore immunocompetence in the *Mycobacterium leprae* infected mice. However, following injection of a combination of the two cell types, reversal reactions with upgraded immunity and a shift in the clinical picture from BL to BB/BT were observed. The best response was evident when thoracic duct lymphocytes were transfused in combination with the B lymphocytes or thymus grafts were made in combination with the B cells, suggesting thereby lymphocyte cell synergism in leprosy.

It is conceivable that genetic factors may contribute considerably to the observed differences in immune responsiveness to and disease manifestations after infection with *M. leprae*. If markers for susceptibility and/or resistance would be available, one could delineate in a population those individuals prone to develop leprosy or a particular leprosy type. Moreover, if it were possible to identify the products of susceptibility genes, one would

tion and Control of Pollution Act of 1974.

The institute brought out for the first time a Directory on Environmental Organizations in India, which provides information on 219 organizations engaged in the environmental engineering and related fields. In addition, 25 special project reports were published during the year.

be able to study mechanisms of interaction between these products and *M. leprae*.

Family studies were undertaken in the leprosy endemic area of Wardha, Maharashtra, in order: (i) to test HLA-linked control of immune response to *M. leprae*; (ii) to type for HLA-D related B cell antigens because possible leprosy susceptible genes might be in closer linkage with HLA D-locus and, therefore, in stronger linkage disequilibrium with alleles coding for the HLA-D determinants; (iii) to screen sera obtained from healthy wives and mothers of leprosy patients for B cell antigens associated with leprosy or leprosy type; and (iv) to test the segregation patterns of a number of genetic markers not linked to HLA, specifically C³ (complement) because of an observed association between leprosy and C3^F.

Fourteen families were selected from the out-patient files of the Gandhi Memorial Leprosy Foundation, Wardha. The criterion for selection of these families was two-fold: (i) there should be at least two siblings affected with the leprosy and at least two healthy sibs older than the youngest affected sib, and (ii) both parents in family should be available.

HLA typing of the A, B, C locus was done utilizing the standard NIH micro-lymphocytotoxicity method; HLA-D related serology for the B cell antigens was performed by the two-colour fluorescence test.

A significant excess of identical HLA-haplotypes ($p > 0.05$), particularly

from healthy parents, was observed in siblings affected with tuberculoid leprosy, but not in sibships with lepromatous leprosy or with both types of the disease. A phenotype frequency of 81% was observed for HLA-DRw2 both in healthy parents (mainly heterozygous) and in sibships with tuberculoid leprosy (mainly homozygous). It appeared that DRw2 segregated preferentially ($p = 0.03$) to children affected with tuberculoid leprosy, but randomly ($p = 0.50$) to those with lepromatous leprosy. Screening of 58 sera from healthy wives or mothers of leprosy patients to detect B cell determinants associated with leprosy or leprosy type and not related to HLA-D or with a specificity different from the defined HLA-DR determinants yielded negative results.

These data confirm the HLA-linked control of the host response to *M. leprae*, define this to susceptibility to tuberculoid leprosy, and show a genetic association between this trait and HLA-DRw2.

Electronic and Dielectric Processes in Opto-electronic Devices

The changes brought about in the electrical properties of semiconductors under the action of radiations form the basis of many opto-electronic devices. In the large area opto-electronic devices, the photoconducting binder layer systems have gained importance in recent years. Hence an understanding of the electronic and dielectric processes of these composite systems is important for their effective technological applications.

The charge carrier generation, trapping and recombination mechanisms in inorganic photoconducting binder layers have been studied by Shri Rabinder Nath (a CSIR research fellow) working under the guidance of Prof. P.K.C. Pillai at the Department of Physics, Indian Institute of Technology, New Delhi. Photoconductivity, photoelectret, thermally stimulated

current (TSC), photodielectric effect (PDE) and electrophotographic techniques were used for the investigations. The binder type photoconductors were prepared by dispersing ZnO, HgI₂, CdS, HgI₂ : CdS, and ZnO : HgI₂ pigments in 40% by weight of polystyrene or silicone resin.

A trap density of $\sim 10^{13} \text{ cm}^{-3}$ in ZnO-polystyrene systems has been found from the non-linear photocurrent, space charge limited current (SCLC) analysis, photoelectret and TSC analyses. The spectral maximum, obtained from photoconductivity, PDE and electrophotographic studies, occurs at $\sim 400 \text{ nm}$ in ZnO sample. In the case of HgI₂-polystyrene binder system, the spectral maximum occurs at $\sim 660 \text{ nm}$ in the PDE and electrophotographic studies. The spectral sensitivity of ZnO : HgI₂ (50 : 50)-silicone resin layer has been found to be maximum among other compositions and is about four times greater than those in pure ZnO and HgI₂ binder layers.

The photoresponse time (τ_r) in ZnO-polystyrene sample obeys $\tau_r \propto I^{-0.8}$ relation, where I represents the intensity of illumination. The photocurrent is found to vary linearly with I , which suggests that monomolecular recombination predominates in ZnO sample. The TSC analysis also supports this view. The relationship $i_{ph} \propto I^{0.7}$ (where i_{ph} is photocurrent) in HgI₂ and CdS samples calls for an exponential trap distribution and the TSC analysis shows bimolecular recombination in HgI₂ : CdS binder system.

The PDE theory, which includes the effect of trapping, has been developed and verified in ZnO and HgI₂ samples. Using this theory, it has been found that the ratio of densities of trapped carriers to free carriers is 10^4 and Debye length is 10^{-3} cm in ZnO sample.

The temperature dependence of the photoresponse time and the electret charge, and TSC analysis give a trap depth of approximately 0.4 eV in negative electrode illumination and 1.17 eV in the positive electrode illumination

for ZnO sample. The values of capture cross-section and attempt-to-escape associated with trapping processes in ZnO sample were found to be 10^{-22} cm^2 and $\sim 10^4 \text{ sec}^{-1}$ respectively.

The ZnO and HgI₂ (50 : 50) pigment in silicone resin has been found to be suitable for electrophotographic coatings and other large area optoelectronic devices.

Shri Rabinder Nath has been awarded a Ph. D. degree from IIT, Delhi, based on these studies.

PERSONNEL NEWS

Appointments/Promotions

Dr J. K. Maheshwari

Dr J. K. Maheshwari of the National Botanic Gardens (NBG), Lucknow, has been appointed Scientist EII, on promotion from Scientist EI with effect from 17 December 1975. Dr Maheshwari (born 6 Dec. 1931) obtained his M.Sc. (1953) and Ph.D. (1957) degrees in botany from the University of Delhi, Delhi. Before joining NBG (1966) as Assistant Director, he worked in the Botanical Survey of India as a Curator and as Systematic Botanist at the Central National Herbarium, Sibpur, Howrah, and as Reader in Taxonomy in the Department of Botany, University of Delhi. He was Joint Director, Botanical Survey of India, from August 1974 to February 1977.

Dr Maheshwari has been engaged for over 25 years in research on Indian floristics, phytogeography, plant conservation and nomenclature of flowering plants. He visited the Andaman and Nicobar Islands in May 1975 as a member of the multi-disciplinary study team appointed by the Union Ministry of Agriculture and Irrigation. In September 1975, he participated as Indian delegate in the twelfth general assembly and the thirteenth technical meeting of the International Union for Conservation of Nature and Natural Resources (IUCN) held at Kinshasa, Zaire. He attended IUCN meetings in Morges (1976) and visited

botanical research centres in Geneva, Lausanne, Zürich and Basle. He has served as a member of several academic societies, scientific committees and organizations such as Flora Wing of Indian Board for Wild Life; Joint Committee of Management for Indian Botanic Garden; advisory committee of the Centre for Advanced Study in Botany of the University of Delhi; Birbal Sahni Institute of Palaeobotany; Scientific Evaluation and Implementation Committee of the Botanical Survey of India; Environment Research Committee, Nature and Resource Conservation Subcommittee and National Man and Biosphere (MAB) Research Committee of DST; Indian Society of Desert Technology; several ISI committees; editorial committee of The Wealth of India series; and Council for Application and Extension of Technology to Rural India. In 1975, he was nominated as a member of the IUCN Commission on Education (Morges) and as a member of the board of advisory editors of *Environmental Conservation*, published by Elsevier, Sequoia, S. A., Lausanne.

Dr Maheshwari has published more than 120 research papers, review articles and survey reports, and two books entitled 'The Flora of Delhi' and 'Illustrations to the Flora of Delhi'.

* * *

Shri Kishan Lal of the Indian Institute of Petroleum (IIP), Dehra Dun, has been promoted as Administrative Officer (Selection Grade) (13 Feb. 1978).

* * *

Shri A. Jayaraman and Dr A. K. Bhatnagar of IIP, Dehra Dun, have been promoted as Scientist B (15 Feb. 1978).

* * *

Consequent on assessment, Dr R. Moolchandra of IIP, Dehra Dun, has been promoted as Scientist A (3 Dec. 1973).

* * *

The following have been promoted at the Central Drug Research Institute,

Lucknow: Dr M. K. Sahib (from Scientist B to Scientist C; 1 Feb. 1976); Smt. A. J. Arif (from Scientist A to Scientist B; 14 Dec. 1977); Shri J. P. Upadhyay (from Scientist AI to Scientist BI; 14 Dec. 1977); Dr (Km.) Q. Jehan (from SSA to Scientist A; 14 Dec. 1977); Shri S. A. Kidwai (from SSA to Scientist A; 1 July 1977); Dr R. C. Gupta (from SSA to Scientist A; 5 Jan. 1977); Dr S. K. Agarwal (from SSA to Scientist A; 20 March 1977); Dr T. C. Asthana (from SSA to Scientist A; 28 Feb. 1977); Shri Satyawar Singh (from SSA to Scientist A; 14 Dec. 1976); Shri A. N. Tangri (STA to Scientist AI; 10 Feb. 1977); and Shri H. P. Thapliyal (from STA to Scientist AI; 3 Jan. 1977).

Honours

Dr M. G. Anantha Padmanabha Setty of the National Institute of Oceanography, Goa, was elected a member of Sigma XI, a scientific research society of North America, by the international chapter of the society on 22 December 1977. This is in recognition of his contributions to geological oceanography. Dr Setty has also been a member of Sigma Gamma Epsilon (USA), the Society of Economic Paleontologists and Mineralogists (USA), and the Geological Society of India.

* * *

Prof. A. Rahman, Chief (Planning), CSIR, and the Head, Centre for the Study of Science, Technology and Development, has been elected a member of the International Institute of Communications (London) for the year 1978.

PATENTS FILED

333/Del/77 : An insulated stove, P. N. Bhambi & S. K. Khanna—IIP, Dehra Dun.

398/Del/77 : A new automatic machine for the manufacture of building blocks by moulding under high pressure, B. V. Subrahmanyam, G. S. Ramaswamy, S. V. Nagaraju, A. Chakravarthy & A. Narayanaswamy—SERC, Madras & MERADO, Madras.

399/Del/77 : Improvements in or relating to a rotating cup anemometer, T. K. Sivadas—NIO, Goa.

403/Del/77 : A rotary table press for sand-lime bricks, R. L. Gupta, B. Dass, D. K. Gautam & S. P. Garg—CBRI, Roorkee.

414/Del/77 : Development of an improved process of manufacturing impellers of centrifugal pumps, B. C. Swain & B. C. Mohanty—RRL, Bhubaneswar.

FORM IV

(See Rule 8)

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CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Newer Fibres and Composites: Symposium at Sasmira

The third international symposium on Newer Fibres and Composites was held at the Silk & Art Silk Mills' Research Association (Sasmira), Bombay, from 20 to 24 February 1978. The symposium, organized by the Department of Science & Technology and Sasmira in collaboration with the United Nations Development Programme (UNDP) United Nations Industrial Development Organisation (UNIDO), aimed at bringing together the experts in the field from all over the world to build up technical know-how in newer fibres and composites. More than 200 delegates from various national laboratories and other research institutions in India as well as abroad participated in the symposium spread over seven technical sessions. Forty-five papers relating to newer fibres and composites were presented in technical sessions which covered the technology of glass fibres, carbon fibres and resins, and the processing of composite materials. Product design using composites and testing for quality control were also reviewed at the symposium. Each session started with a keynote address in a particular field by a foreign scientist followed by a keynote address by an Indian participant describing the state of art in that particular field in the country. These addresses brought to sharp focus the gap that exists between the state of art in India and that available internationally.

Shri D. N. Shroff, President of Sasmira, who inaugurated the symposium, said that the newer fibres and composites had a great role to play as they

afford flexibility of designing with perfect control of properties. While referring to the various UNDP projects being operated in India, Shri Shroff mentioned the demonstration plant for synthetic fibres being implemented at Sasmira. The project is being sponsored by UNDP and the Federal Republic of Germany.

Earlier, while welcoming the delegates, Shri J. G. Parikh, Director of Sasmira, emphasized the potentialities of newer fibres and composites in a developing country like India and observed that newer fibres are finding wider uses for reinforcement of resins and plastics and for making strong and light structures.

Dr V. G. Bhide of the National Physical Laboratory, New Delhi, mentioned that the project on newer fibres and composites is being implemented by the Department of Science & Technology in collaboration with UNDP/UNIDO. Six institutions, viz. the Central Glass & Ceramic Research Institute, Calcutta; the Indian Institute of Technology, Kanpur; the National Aeronautical Laboratory, Bangalore; the National Physical Laboratory, New Delhi; the Central Leather Research Institute, Madras; and the Vikram Sarabhai Space Centre, Trivandrum, are participating in this project to develop the necessary technology.

The application of fibreglass products in various fields was elaborated at the symposium. Fibreglass products can now be used for tube wells, glass-reinforced plastics (GRP), irrigation channels, portable grain silos, and storage bins.

The spectacular progress achieved in medicine as a result of the application of carbon fibre technology was reviewed by the foreign experts. Carbon fibres and carbon fibre reinforced composites are now being used for bone transplantation and as artificial ligaments. The technology can be further used in manufacturing lightweight vehicles, which will reduce energy consumption substantially and thereby solve the energy problem, according to foreign scientists.

The scope of developmental use of glassfibres, ceramic fibres, carbon fibres, resins and composites for various applications was elaborated. Their applications from agriculture to aerospace, covering a wide spectrum of chemical and engineering disciplines, were also reviewed at the symposium.

A two-day workshop was also held on 23 and 24 February 1978 in which chairmen of various technical sessions and speakers participated. The workshop discussed in detail the progress made by the laboratories participating in the project.

CECRI Celebrates Silver Jubilee

The Central Electrochemical Research Institute (CECRI), Karaikudi, has been observing 1978 as its silver jubilee year. A number of functions starting from 14 January 1978 have been arranged in this connection. The institute was declared open on 14 January 1953 by the then Vice President of India Dr S. Radhakrishnan.

The silver jubilee function was inaugurated by Shri N. Chandappa, a

leading industrialist and president of the Society for Advancement of Electrochemical Science and Technology for this year. In his inaugural address, Shri Chandappa complimented the institute on its praiseworthy contributions to the electrochemical industries as well as for the awards it has received for its work in electrochemical science and technology. He appealed to the scientists to spare no efforts in minimizing the country's dependence on imported technology.

Prof. K. S. G. Doss, former Director of the institute, presided over the inaugural function and delivered the first silver jubilee lecture titled 'Creativity in Scientific Research'.

In his welcome address, Dr H. V. K. Udupa, Director of CECRI, spelt out the objectives of the institute and reviewed its progress over the last 25 years. In summing up the achievements, Dr Udupa mentioned that 70 processes were released to 152 firms all over the country and 40 of these firms had started production. The value of goods so far produced by these firms amounted to more than Rs 38 million. The indigenous production based on the CECRI know-how had also saved the country considerable amount of valuable foreign exchange, he added.

The work carried out in the institute has been reflected through the publication of 973 papers and filing of 283 patents. The institute has trained 460 technologists from a number of organizations through refresher courses organized every year. So far, 23 sponsored schemes and 29 consultancy services have been successfully completed.

The second silver jubilee lecture was delivered by Prof. V. R. Muthuveerappan of the Annamalai University, Chidambaram, on 'Solar Energy—Research and Development for Rural Application' on 21 February 1978.

Low-Cost Unit for Defluoridation of Water : NEERI

The National Environmental Engineering Research Institute (NEERI), Nag-

pur, has developed a low-cost and easily adaptable method for defluoridation of water. The method is suitable for small communities of population ranging from 200 to 2000. Based on the Nalgonda technique for defluoridation developed earlier by NEERI, the process consists in adding requisite quantities of alum, lime and bleaching powder in water of high fluoride content, stirring for a while and then allowing it to settle. The settled sludge is discarded and the supernatant is suitable for domestic use.

In many parts of India, the problem of excess of fluorides in the ground water is encountered. The permissible and excessive limits of fluorides in drinking water, as prescribed by the Union Ministry of Health and Family Welfare, are 1.0 and 2.0 mg/litre respectively. Consumption of water containing 1.5 mg/litre or more of fluorides, particularly during the first eight years of life, leads to dental fluorosis which is evident from the severe mottling of teeth. Ingestion of high fluoride through water over a period of 10-20 years results in crippling fluorosis and osteosclerosis. Calcification of certain ligaments renders movement of joints difficult and the individual becomes incapacitated.

Batch Briquette Curing Plant at CFRI

Briquettes of char, coke breeze (fine), semi-anthracite and similar materials are being manufactured by industry utilizing processes developed and patented by the Central Fuel Research Institute (CFRI), Dhanbad. Researches currently pursued at CFRI are aimed at using the briquettes in domestic ovens, industrial grates, and metallurgical furnaces.

The tar/bitumen bound briquettes are subjected to oxy-thermal treatment, known as curing, which imparts the briquettes hardness, water-, weather- and abrasion-resistance, and smokelessness. The curing process involves careful control of a number of factors like time, temperature, turbulence and

oxygen flow. A coal-fired experimental curing plant (output, 600 kg/batch) has been set up at the institute. The plant, operated by circulating hot flue gas generated by the burning of coal, has completed successful trial runs.

The main features of the experimental plant are simplicity in design, ease in construction, and economy in electricity consumption. The other advantages of the plant are that it eliminates any risk of explosion and minimizes air pollution hazard. The product from this unit has been tested in small cupolas and found satisfactory. Further modifications are being made for effecting improved charging and discharging arrangements. The plant has good potentiality for use in a small-scale briquette industry.

Solar Still Commissioned at Avania Village

A desalination plant based on solar energy was commissioned at Avania village, 11 km from Bhavnagar, by the Chief Minister of Gujarat, Shri Babubhai Jashbhai Patel, on 5 March 1978.

This solar still plant was developed at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, and the entire construction and installation work was carried out by the CSMCRI scientists. The plant has a capacity to produce 5000 litres of product water per day. The plant consists of 90 stills with a total evaporating surface of 1870 m². Avania village is non-electrified and the well water for community use is brackish and contains dissolved salts to the extent of 2750 mg/litre and fluoride to the extent of 6 mg/litre. According to WHO standard, the maximum permissible limits of dissolved salts and fluoride per litre are 1000 mg and 1.5 mg respectively.

Inaugurating the plant, the Chief Minister complimented the CSMCRI scientists for their efforts to solve the problem of drinking water in villages through such novel techniques. In a reference to the fast depleting ground resources of oil, Shri Patel stressed the

need for exploitation of solar energy and the significance of CSMCRI's work. In his welcome address, Dr D. J. Mehta, Director of CSMCRI, said that the purpose of installing the solar still was two-fold, viz. (i) to cater to the potable water needs of villages like Avania where no electricity is available; and (ii) to demonstrate the viability of such plants.

The Council of Scientific & Industrial Research made available a sum of Rs 2.5 lakh for installing the plant.

Ergot Production in India

The farms of the Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, obtained a record yield of 16.5 tonnes of ergot during 1977-78, which is considerably higher than the highest yield of 14.4 tonnes in 1975-76. Ergot and its alkaloids are some of the most widely used therapeutic agents to control post-partum haemorrhage and to treat migraine.

Prior to 1966, the country's requirements were met through imports costing Rs 10 lakh annually. In collaboration with the Regional Research Laboratory, Jammu, CIMPO developed indigenous technology for the commercial production of ergot. Using this technology, CIMPO started with an initial production of 69 kg in 1966-67 in its farms in Jammu & Kashmir. As a result of further improvement in agrotechnology by the R & D unit of CIMPO it was possible to step up the production substantially to 12.7 tonnes in 1973-74 and 14.4 tonnes in 1975-76, effecting a net saving of Rs 9.03 lakh and Rs 10.2 lakh in foreign exchange. As a result of indigenous production of this crude drug, its import has been discontinued since 1974-75.

More recently, ergot has been introduced in the Haldwani and Kumaon Hills of U. P., and a superior strain having 0.6% total alkaloids and 0.4% ergotamine has been developed by CIMPO.

The ergot produced by CIMPO is superior in quality to the drug imported from Europe, and is, therefore, readily acceptable to the pharmaceutical industry.

BITM's Exhibition on Minerals

An exhibition on 'Our Minerals' was held at the Birla Industrial and Technological Museum (BITM), Calcutta, from 25 January to 5 February 1978. Organized by BITM in collaboration with the Oil & Natural Gas Commission, Geological Survey of India, Atomic Minerals Division of the Department of Atomic Energy, and Coal India Ltd, the exhibition depicted, among other things, the history of geological exploration in India, geophysical prospecting, geochemical testing and identification of minerals.

One of the sections described the methods of geological exploration and also provided an overview of the history of organized geological exploration in India. In the coal and oil section, a working model of Sagar Samrat engaged in offshore oil drilling near Bombay High was of special interest. A section on radioactive minerals and gemstones displayed a collection of gemstones along with replicas of 12 famous diamonds of the world. Other exhibits displayed included : moon rock; diorama showing the ancient process of iron-making in India; working model of 'workover rig'; search for minerals; rich collection of minerals; fluorescent minerals; physiography of parts of Indian Ocean highlighting the mineral resources of the ocean floor; some actual stone implements; and an original cupola used in ancient metallurgy in India.

A seminar, a popular lecture, a quiz contest programme for college students, and special film shows on minerals were also organized on the occasion.

The exhibition was inaugurated by Shri T. N. Singh, Governor of West Bengal, and the function was presided over by Dr K. L. Bhattacharjee, Minister of Commerce and Industries, Government of West Bengal.

The exhibition drew 16,620 visitors including 7344 students from 133 schools.

Deputation Briefs

Shri Devendra Sharma of the Manpower Division, CSIR Complex, New Delhi, was deputed to Poland for about two months during September-October 1977 under the CSIR-Polish Academy of Sciences exchange programme to study the educated manpower planning in that country.

At the Forecasting Research Centre of the Technical University, Wroclaw, Shri Sharma studied 'Simulation methods in manpower forecasting', 'Methodology of forecasting the university development' and 'R & D forecasting'. At the Academy of Economics, Wroclaw, he studied econometric models for comparing the living standards of peoples of various countries. He visited the University of Economics at Katowice where he observed that the manpower planning for students at university level and for well-educated persons was such that none of them had any problem for employment, as various industries and institutions had ready plans to absorb them. Shri Sharma discussed manpower problems with the specialists of the Polish Academy of Sciences at Krakow. He studied some statistical and economic models on manpower at the Institute of Planning and Statistics, Warsaw. He also availed himself of the opportunity offered by the Planning Commission of the Polish government to study the methodology of deployment of educated manpower.

Shri Sharma also visited some institutions in France, West Germany and UK engaged in manpower studies. These included the International Institute of Educational Planning, Paris; Trade Union Research Institute, Düsseldorf; Ministry of Labour, Bonn; London School of Economics, London; Institute of Manpower Studies, University of Sussex; and Future Study Centre, Leeds, UK.

PROGRESS REPORTS

SERC Annual Report : 1976-77

The Structural Engineering Research Centre (SERC), Roorkee/Madras, has

brought out its annual report for the year 1976-77. The report shows that the laboratory undertook 28 research projects and 14 consultancy projects during the year.

The surveys of live loads on the New Yamuna Bridge at Agra and the Hindan Bridge at Ghaziabad were completed and a report containing recommendations on design live loads for bridges was prepared. The know-how for the production of small capacity grain storage bins in ferrocement was released to a party through the National Research Development Corporation of India. Work was also continued on the design of biogas plants for both individual and community use. The other projects in progress at the Roorkee Centre include interaction analysis of prestress losses, computer analysis of guyed towers, and automated dynamic analysis of three-dimensional rigid-jointed towers and frames. Work on the preparation of an explanatory handbook for the Code of Practice for Structural Concrete was continued at the Roorkee Centre.

The method of evaluation of prestress losses developed earlier was modified so as to take into account the actual locations of the individual rows of tensioned and untensioned reinforcement. The method also takes care of the variation of the modulus of elasticity of concrete with time and also the variation of the superimposed dead loads applied, if any, at any time interval. A general computer programme has been developed for the estimation of prestress losses in pretensioned beams with or without untensioned reinforcement.

Software was developed for finding the natural frequencies and modes of plates for any type of boundary conditions using triangular plate elements. It is now possible to assess the natural frequencies and determine the mode shapes for simple or T-beam floor grids, multi-girder or beam-slab bridge decks, and plates of different shapes under different boundary conditions.

Another important project related to the development of small-capacity

ferrocement bins useful to rural farmers. A semi-mechanized casting process was developed for casting ferrocement cylindrical wall units. The dimensions of the various prefabricated components of the ferrocement bins were standardized in such a manner that the weight of any single component did not exceed 120 kg. These bins can be assembled easily with manual labour (4 to 5 persons).

Analysis and design of cylindrical ferrocement bins of up to 3 tonnes capacity using the classical theory of shells was carried out. Tests for waterproofing of the bin units were also carried out, and based on the tests, two coats of bituminous aluminium paint on the outer surface were recommended for above-ground bins. For underground bins, two coats of coal-tar emulsion or bituminous paint were recommended. Load testing was done with grain on a 3-tonne unit. The behaviour of the bin was quite satisfactory under loading and unloading operations. Evaluation tests carried out at the Central Food Technological Research Institute, Mysore, showed that both the above-ground and underground bins were suitable for storage of food grains. A patent has been filed on this process.

In addition to grain storage bins, the technology developed by SERC can be used for the manufacture of small-capacity water tanks for household and farm use, especially to meet the demands for protected water supply in rural areas.

Work on the setting up of the model analysis laboratory at Madras is nearing completion. A photoelastic oven has been commissioned, and a 5-tonne universal testing machine is being installed. The following facilities were also established: Shadow moire and Lightenberg; Optical bench elements; Loading frame for holographic interferometry; and Reproduction of gratings. Tests in holographic interferometry included calibration and determination of the efficiency of holographic plates and discs under diametrical load and a cylindrical shell under point load. In

the moire technique, a ribbed slab was tested using the shadow moire and Lightenberg techniques. Filtering and fringe sharpening experiments were conducted using the optical bench on a model of a wall panel under concentrated load. Three-dimensional photoelastic experiments were conducted on a cylindrical specimen under concentrated load using stress freezing technique. Many of these experiments were conducted during September-December 1976 under the guidance of Prof. C. A. Sciammarella, UN consultant, on model investigations. It is proposed to develop suitable computer programmes for obtaining the final results from experimental data. The tele-terminal equipment has been installed and will be linked to the IBM 370/155 computer system available at the Indian Institute of Technology, Madras, as soon as the interface equipment is received. The Madras Centre made substantial progress in the installation of the tele-terminal and in the strengthening of laboratories for model analysis, polymer concrete, and structural dynamics and machine foundations, with UNDP assistance.

One of the important consultancy projects completed during the year relates to the investigations on the large diameter prestressed concrete pipes of Veeranam Water Supply Project. The know-how for the production of prestressed concrete sleepers for the Indian Railways has been released to a party. Several agencies are building ferrocement water tanks based on the designs furnished by the centre. The construction of the 144 residential flats by the Tamil Nadu Housing Board at Madras based on the on-site prefabrication system developed by SERC has been completed.

SERC continued to participate in the Karimnagar project. Besides providing detailed design and technical assistance in the construction of several buildings based on the know-how developed at the centre, it also helped in the setting up of a community gobar gas plant in a village in this district.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Constricted TIG Cutting Machine

Nonferrous metals and stainless steels are usually cut mechanically by guillotine shears, bend saws, and other such equipment. Some arc cutting processes, like tungsten inert gas (TIG) welding equipment and carbon arc processes, are also being used. However, the arc cutting processes are of limited value because of excessive consumption of electrodes, low cutting speed and high labour costs. The constricted arc cutting produces high-quality cut at higher speeds. The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has designed a constricted TIG arc gas torch which can cut aluminium, copper and other metals. Copper, for instance, can be cut up to 35 mm thickness and stainless steel up to 20 mm thickness, by the use of indigenous power source. With an imported power source, however, a much higher thickness can be cut. This process is an improvement over other mechanical and arc cutting methods for nonferrous metals and stainless steels. The cut surface is free from dross and is very clean and needs no further machining. The cutting speed is much higher than that obtained by conventional methods.

In this process, an electric arc is ignited between a tungsten electrode and water-cooled nozzle. The arc is constricted at the job by the magnetic field created by the arc current, high velocity gas stream and water-cooled constricted orifice. This arc between the tungsten electrode and work-piece is concentrated and localized on a small area of the job. The high temperature of the arc melts the metal and cuts it. The gas, which is preheated by the arc, expands greatly and is forced through the constricting orifice. The molten metal is continuously removed by the jet-like action of the gas stream.

The design specifications of the machine are as follows :

Type of torch	: machine torch
Cutting speed	: 20-250 cm/min.
Current capacity	: 500 A dc
Cutting voltage	: 100 V dc
Gas flow rate	: 2000 litres/hr of 35% H ₂ and 65% argon
Max. plate thickness to be cut	: 35 mm of Al and Cu and 20 mm of stainless steel
Torch adjustment	: 7 cm vertical; 9 cm transverse
Wheel based gauge	: 33 cm
Speed control of carriage motor	: eddy current governor
The control panel includes relay, solenoid valves, flow meters, ammeter,	

voltmeter, high frequency unit, water pump, and a switch panel. The power source is of welding rectifier type, two in series.

One prototype has been tested at the institute and found to be working satisfactorily.

Most of the equipment are available indigenously. The thoriated tungsten electrode has to be imported. The total cost comes to Rs 20,000, excluding the cost of the power source.

Further particulars regarding the machine can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

CSIR SUPPORT TO RESEARCH

Completed Schemes

Convergence of State Distributions in Multi-type Bellman-Harris and Crump-Mode-Jagers Branching Processes

Athreya and Kaplan have proved recently that the age distribution in a one-type supercritical Bellman-Harris process converges with probability one to a deterministic distribution, assuming either a ' $j \log j$ ' hypothesis on the offspring distribution or a tightness condition on the life-time distribution. Shri K. Rama Murthy (a CSIR research fellow), working under the guidance of Prof. K. B. Athreya in the Department of Applied Mathematics at the Indian Institute of Science (IISc), Bangalore, made use of the ideas contained in the above work to prove the convergence of the state distribution in a multi-type Crump-Mode-Jagers branching process. In this process, unlike in the Bellman-Harris process, the particles can produce offspring throughout their life-time, thereby making the process more realistic (also, the offspring production measures are not assumed to be independent of the life-time variables).

A rigorous construction of the Crump-Mode-Jagers branching model is first provided using the Ikeda-Nagasawa-Watanabe theory. Next, the convergence in probability of the state distribution in the supercritical case is proved under a finite first moment hypothesis and the convergence with probability one under a ' $j \log j$ ' hypothesis. In the critical case conditioned on non-extinction, the convergence in probability is proved under the hypothesis that the population size, conditioned on non-extinction, goes to infinity in distribution, and the hypothesis that

$[1 - q(t+s)]/[1 - q(t)] \rightarrow 1$ as $t \rightarrow \infty$ for each fixed s , where $q(t)$ is the probability of extinction by time t . (These hypotheses are shown to hold automatically for a multi-type Bellman-Harris process under a tightness condition on the life-time distributions).

The above results are then specialized to the multi-type Sevastyanov process (in which the particles produce offspring only at the time of their death, but the offspring distributions are not necessarily independent of the life-time distributions) and the multi-type age-dependent birth and death process (introduced by Kendall) by

translating the hypotheses in terms of the life-time and offspring distributions in the former case and the birth and death rates in the latter. Finally, for the supercritical multi-type Bellman-Harris process, the ' $j \log j$ ' hypothesis is eliminated and the almost sure convergence of the age and type distribution is proved under a tightness condition on the life-time distributions. Also, in the critical case conditioned on non-extinction, the convergence of the age and type distributions is established under the same tightness condition on the life-time distributions, thus extending fully to the multi-type case the results of Athreya and Kaplan.

Based on this work Shri Rama Murthy has submitted his thesis for the doctorate degree of IISc.

PERSONNEL NEWS

Honours & Awards

Dr R. V. Unnithan

Dr R. V. Unnithan of the Cochin regional centre of the National Institute of Oceanography has been awarded D. Sc. degree of the University of Cochin for his post-doctoral work which breaks new ground in the systematics of monogenetic trematode parasites. The work has rationalized the classification of these helminths in the light of the comprehensive anatomy of the clamps and analysis of the dynamics of the axial growth potentials of the haptor region. Unnithan's new revised systematic scheme arrives at a more acceptable arrangement for the study of monogenetic trematodes. The work was carried out during the International Indian Ocean Expedition at the Indian Ocean Biological Centre and subsequently at NIO.

Appointments/Promotions

Dr S. K. Roy

Dr S. K. Roy, head of the Division of Endocrinology, Central Drug Research Institute (CDRI), Lucknow, has been appointed Scientist EI on promotion from Scientist C (30 June 1977).

Dr Roy (born 20 August 1925) obtained his B.Sc. (1946), M.Sc. (1948) and D.Phil. (1951) degrees from the Allahabad University. He was an assistant professor of zoology at the Birla Institute of Technology & Science, Pilani (1951-52). He has been recipient of postdoctoral fellowships of the National Research Council of Canada (1956-58) and the University of Buffalo (1958-59); and Population Council Biomedical Research fellowship in reproductive physiology at the Rutgers University, USA (1959-61); and Worcester Foundation training programme fellowship in physiology of reproduction, Shrewsbury, Mass., USA (1961-62).

Dr Roy has carried out research mainly in the physiology of reproduction including thyroid physiology, hormonal control in the mechanism of implantation of ovum, protein malnutrition related to pregnancy, mechanism of action of copper intra-uterine devices, drug metabolism and mechanism of action of contraceptive drugs.

Dr Roy participated in the International Congress on Hormonal Steroids at Milan in 1962. He is a member of the Society of Endocrinology (UK) and had been a fellow of the Zoological Society of London, fellow of the Royal Microscopical Society and member of the American Association for the Advancement of Science.

Dr Roy is engaged in many projects of the antifertility research programme of CDRI and has published nearly 60 research papers.

Dr R. N. Sur

Dr Rabindra Nath Sur of the Central Drug Research Institute (CDRI), Lucknow, has been promoted to Scientist EI with effect from 1 February 1977.

Dr Sur (born 1 March 1921) took his M.B.B.S. (1946), D.T.M. (1950), and Ph.D. (1977) degrees from the Calcutta University. He joined the division of pharmacology of CDRI in July 1952. Deputed to UK in 1954, he underwent training in experimental

pharmacology and neurophysiology for a year under Dr R. C. Garry, Professor of Physiology, University of Glasgow. During January 1957 to July 1968, he was analyst concerned with the pharmacological quality control of drugs and pharmaceutical preparations for the Drugs Controller of the Government of U.P.

Dr Sur is currently studying the effects of compounds on the central nervous system, with particular reference to the electrical activity of the brain in cat. He has published 16 research papers.

Shri S.K. Srivastava

Shri S.K. Srivastava of the Central Drug Research Institute (CDRI), Lucknow, has been appointed, on promotion, Scientist EI with effect from 1 June 1977.

Shri Srivastava (born 5 July 1932) took his B.Sc. (1951) and M.Sc. (organic chemistry, 1953) degrees from the Allahabad University, joined the medicinal chemistry division of CDRI in September 1953. Srivastava has carried out research in natural products chemistry and has several noteworthy publications on the metabolism of reserpine. He has also developed new methods of chemical assay for several medicinal plants and pharmaceutical preparations. He is currently engaged in process development and pilot plant investigation of drugs, as also their intermediates, aimed at new and economical processes.

As a project leader, Srivastava has been responsible for the development of 12 processes, of which six have been released to drug firms. He has published 15 research papers.

Shri A.K. Moitra

Shri Anil K. Moitra of the Coal Survey Laboratory (Jharia) of the Central Fuel Research Institute (CFRI), Dhanbad, has been appointed, on promotion, Scientist EI with effect from 1 August 1976.

Shri Moitra (born 1924) graduated from the University of Calcutta in 1944

and joined as a chemist, in 1947, the central laboratories of Steel Corporation of Bengal (now merged with Indian Iron & Steel Co. Ltd) at Kulti (West Bengal). Moving to CFRI in 1949, he has been engaged in extensive physical and chemical surveys of the coking coal resources of India.

Shri Moitra was associated with the envisagement, planning and projection of a number of coal-washing plants in India for beneficiation of high-ash coking coals for the manufacture of metallurgical coke in the coke ovens. An expert in survey and resource quality assessment of coals, Shri Moitra was member of the team which prepared a complete technology report on Lower Seam (V/VI/VII/VIII) coals of Jharia coalfield, hitherto considered inferior. The report established the inherently strong caking character of the coals and also indicated a possible additional source of coking coals. Shri Moitra was also associated with investigations on the utilization of 'Jhama' or 'natural coke' as a replacement for hard coke in foundry practice.

Shri Moitra has published several research papers with special reference to coking coals of Giridih and Jharia coalfields, and has been associated with the preparation of a number of reports.

Dr M. C. Nigam

Dr M. C. Nigam of the Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has been appointed, on promotion, Scientist EI with effect from 1 February 1977.

Dr Nigam (born 22 June 1935) obtained M. Sc. (1956) in organic chemistry from the D.A.V. College, Kanpur, and Ph. D. (1961) from the Harcourt Butler Technological Institute, Kanpur. He headed the essential oils section of the Regional Research Laboratory, Jammu, during 1961-63 and 1964-72. He was a post-doctoral fellow working with Dr Leo Levi of the Food & Drug Directorate, Ottawa, during 1963-64, and his work related mostly to the chemotaxonomy of the

genera *Mentha* and *Cymbopogon*. Dr Nigam has carried out investigations on food flavours and essential oils of Indian origin such as oils of ginger, cardamom, gingergrass and marihuana. He joined CIMPO as head of its chemistry division in 1972.

Dr Nigam has 85 research papers and three patents to his credit.

Resignations

Dr P. C. Ghosh, Scientist C, Central Fuel Research Institute Dhanbad, has resigned (26 January 1978).

PATENTS FILED

511/Del/77 : Development of a process for the manufacture of low-ash carbon from coke breeze. B. C. Swain, B. C. Mohanty & P. K. Jena—RRL, Bhubaneswar.

512/Del/77 : Development of a process for manufacture of mineral wool fibre boards, S.K. Bhaumik, B.C. Swain, B. C. Mohanty, S. N. Mahapatra & P. K. Jena—RRL, Bhubaneswar.

513/Del/77 : Manufacture of acetic anhydride and compression of ketene simultaneously using a liquid ring type compressor, V. Srihari, G. V. Yugandhar & P. S. Murti—RRL, Hyderabad.

514/Del/77 : An improved, new all-glass extraction apparatus, N. K. Das & S. C. Basa—RRL, Bhubaneswar.

515/Del/77 : Improvements in or relating to the electrolytic production of glyoxylic acid from oxalic acid, H. V. K. Udupa, K. S. Udupa, S. Thangavelu, P. Subbiah, K. Jayaraman & P. Thirunavukkarasu — CECRI, Karaikudi.

516/Del/77: Processing of manganese for use as anode in cathodic protection, N. Subramanyan, K. Balakrishnan, S. Venkatakrishna Iyer, V. S. Kapali & M. I. Krishnan—CECRI, Karaikudi.

517/Del/77 : A process for making active silica and sodium silicate using paddy husk as raw material, P. C. Borthakur, P. C. Saikia & S. N. Dutta—RRL, Jorhat.

518/Del/77 : Crusher-cum-juice expeller, U. C. Borah & D. K. Dutta—RRL, Jorhat.

519/Del/77 : Improvements in or relating to a wave recorder for measurement of waves in sea, T. K. Sivadas—NIO, Goa.

520/Del/77 : A process for making molecular sieve zeolites from paddy husk, S. N. Dutta, M. C. Upreti, P. C. Borthakur & G. C. Bhattacharyya—RRL, Jorhat.

521/Del/77 : A process for simultaneous electrowinning of zinc and manganese dioxide in the same cell from sulphur bearing zinc concentrate and manganese ore, V. A. Altekar, A. M. Pande & K. N. Gupta—NML, Jamshedpur.

522/Del/77 : A new method of supporting roof or side walls and a rope bolt for use in the same, N. M. Raju—CMRS, Dhanbad.

523/Del/77 : A process for the preparation of new yellow-to-violet azo-N-substituted pyridone disperse dyes for synthetic fibres, N. R. Ayyangar, A. D. Deshpande & B. D. Tilak—NCL, Poona.

14/Del/78 : A process for the preparation of new yellow pyrimidinethionyltriazine disperse dyes for polyester fibres, N. R. Ayyangar, R. J. Lahoti & D. R. Wagle—NCL, Poona.

15/Del/78 : A process for the preparation of new red triazinylazonaphthone disperse dyes for polyester fibres, N. R. Ayyangar, R. J. Lahoti & D. R. Wagle—NCL, Poona.

16/Del/78 : A process for the preparation of new yellow isothiazolanethionyltriazine disperse dyes for polyester fibres, N. R. Ayyangar, R. J. Lahoti & D. R. Wagle—NCL, Poona.

75/Del/78 : Compression of ketene using a liquid jet ejector, V. Srihari, G. V. Yugandhar & P. S. Murti—RRL, Hyderabad.

76/Del/78 : Vacuum guard, V. N. Badami—IIP, Dehra Dun.

85/Del/78 : Improvements in or relating to the preparation of zinc/sodium silicate primer, K. S. Rajagopalan, S. N. Guruviah & M. Sunderam—CECRI, Karaikudi.

Farm Bulletins on Medicinal and Aromatic Plants

The Central Indian Medicinal Plants Organisation, Lucknow, has published nine farm bulletins on important medicinal and aromatic plants. The bulletins have been written in popular language for the benefit of progressive farmers, entrepreneurs and those interested in taking up large-scale cultivation. The bulletins give complete-agrotechnology and economics of cultivation on different plants.

The titles of bulletins, along with their prices, are: (1) Oil of Citronella Java (Rs 1.20); (2) Oil of Japanese Mint (Rs 4.50); (3) Oil of *Mentha piperita* (Black Mint) (Rs 4); (4) Pyrethrum and its cultivation in India (Rs 3); (5) Belladonna and its cultivation in India (Rs 3); (6) Lemongrass and its cultivation in India (Rs 3); (7) Palmarosa and its cultivation in India (Rs 3); (8) *Catharanthus roseus* and its cultivation in India (Rs 3); and (9) Cultivation of *Eucalyptus citriodora* for its essential oil (Rs 3).

The bulletins are available for sale with the Head, Information, Liaison and Extension Division, Central Indian Medicinal Plants Organisation, Lucknow 226007. The postage for all the bulletins together is Rs 3.40 and separately Re 0.55 each for Nos. 1-8 and Re 0.70 for No. 9.

Influence of Calcium Chloride Admixture on Reinforcement Corrosion in Concretes

This is a report brought out by the Cement Research Institute of India (CRI), New Delhi, and contains the findings of the investigation made at the institute on the use of calcium chloride as admixture for accelerating setting and hardening of concretes.

Owing to the possibility of its inducing corrosion of the steel reinforcement the use of calcium chloride has been forbidden in the Indian Standard

Code of Practice for Plain and Reinforced Concrete (IS : 456-1964). However, because of the advantages of calcium chloride as an accelerator in winter concreting, as also in precast concrete jobs enabling quicker release of moulds and in fly ash cement concretes for early strength development, the institute studied the role of the compound vis-a-vis reinforcement corrosion, and determined the safe limits of its addition to concrete.

The investigations have shown the safe limits for calcium chloride addition to be 1.5% for plain cement concrete and 1.0% for fly ash pozzolana cement concrete (fly ash cement conforming to IS: 1489-1967 with $25 \pm 3\%$ fly ash, the maximum permitted) under normal curing conditions for 10 days. However, when the concrete ingre-

dients contain chlorides, necessary corrections are to be made to the amount of calcium chloride to be added.

Copies of the publication (RB-7-77) can be had from the Director, Cement Research Institute of India, M-10 South Extension II, New Delhi 110049.

CECRI Refresher Courses

The Central Electrochemical Research Institute (CECRI), Karaikudi, will be organizing three short-term refresher courses on (1) Electroplating, (2) Corrosion and its prevention, and (3) Storage battery technology during June-November 1978. Intending participants may obtain further details from the Director, Central Electrochemical Research Institute, Karaikudi 623006.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 4/78

It is proposed to appoint a Scientist F (Deputy Director) for the Regional Research Laboratory, Hyderabad.

Job Requirements : It is a research management post in the field of mineral products and inorganic chemicals. The incumbent will be responsible for providing high-level leadership to formulate, plan and undertake R & D work in the area of utilization of minerals and industrial inorganic chemicals. The current R & D programmes in this area relate to activated carbons from several raw materials, bleaching earths, filter aids and development of catalysts and inorganic chemicals. The incumbent may also be required to assist the Director in his administrative and managerial jobs.

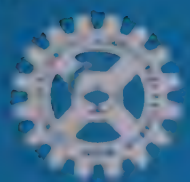
Qualifications and Experience : High academic qualification in inorganic chemistry with at least 15 years' R & D experience, preferably in one or more fields of utilization of minerals and industrial inorganic chemicals mentioned above. The experience should include setting up and operation of bench and pilot scale units for process development in a good R & D institute or industry.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. The person selected would be eligible for appointment on contract for six years (including the probation period) after successful completion of a probation period of two years. Other conditions of contract will be supplied on request.

Age Limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain standard proforma for sending their *curriculum vitae* from Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the laboratory. Completed *curriculum vitae* proforma should be received in this office on or before 10 May 1978.

Canvassing in any form and or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

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Ion-Exchange : Symposium at CSMCRI

One hundred and five papers covering various aspects of the applications of ion-exchange materials were presented and discussed at a symposium organized by the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, from 23 to 25 March 1978. Nearly 160 delegates from research institutions from India and abroad as also representatives from industry attended the symposium, which spanned over six technical sessions. Inaugurated by Shri S. Krishnaswamy, Secretary, Union Ministry of Chemicals & Fertilizers, the symposium was presided over by Dr R. D. Patel, Vice Chancellor, Sardar Patel University, Vallabh Vidyanagar.

The first session, devoted to synthetic ion-exchange resins, dealt with the preparation of polymers from different raw materials such as acrylonitrile and phenol-formaldehyde, methacrylic acid, and gossypol-based ion-exchange resins. Important resins manufactured from the above raw materials are the porous polymeric substances used in pollution control, especially for the uptake of pollutants like dyes, phenols and detergents.

The applications of ion-exchange resins in the treatment of water and sugar solutions, as also the development of a technique for continuous counter-current ion-exchange for water treatment, were discussed in the second session.

Preparation and characterization of various inorganic ion-exchangers based on silicates and phosphates was

the topic discussed at the third session. Hydrous zirconium oxide and manganese dioxide were considered important ion-exchange materials for the treatment of radioactive waste materials.

The fourth session covered the uses of many inorganic ion-exchange materials based on polyantimonic acid, manganese dioxide, hydrous thorium oxide, zirconium silicophosphate, etc. in radioactive wastes treatment and in analytical chemistry. The papers were based on the experience of research workers at the Bhabha Atomic Research Centre, Trombay.

Unconventional ion-exchange materials and their applications, as for example the use of parchment membranes impregnated with sparingly soluble inorganic compounds, were discussed at one of the sessions.

The sixth session was devoted mainly to water treatment by the electro dialysis method developed at CSMCRI.

In the concluding session, six experts both from research institutions and industry gave their views on the current trends as well as future R & D needs in the ion-exchange technology. The experts were Dr M. D. Karkhanawala of BARC; Dr S. A. Kagal of Tulsi Fine Chemicals Industries, Poona; Dr S. M. Khopkar of IIT, Bombay; Dr G. Scott of the Chemistry Department of Birmingham University (UK); Dr J. D. R. Thomas of the University of Wales (UK); and Dr V. K. Rao of Ion Exchange India, Bombay.

A feature of the symposium was special lectures delivered by Dr I. H.

Abrams of Diamond Shamrock Co., California (USA) on (i) organic fouling of ion-exchange resins, and (ii) use of ion-exchange resins in sugar industry; and by Dr J. D. R. Thomas on the use of liquid ion-exchangers in ion selection electrodes.

CLRI Celebrates Silver Jubilee

The Central Leather Research Institute (CLRI), Madras, celebrated its silver jubilee from 31 January to 6 February 1978. The celebrations were inaugurated by Shri Prabhudas B. Patwari, Governor of Tamil Nadu, on 31 January.

Prof. M. Santappa, Director of CLRI, highlighted, in his welcome address, the activities of the institute. The institute, whose main objective is to develop appropriate technology and transfer it to the leather industry, has proposed to set up a footwear cell to cater to the R & D needs of the footwear industry and a management cell to train managers for leather and allied industries.

CLRI has also proposed, in the silver jubilee year, to take an additional role as the national information centre for leather and allied industries. CLRI is being assigned this task under the programme of the Department of Science and Technology for initiation and development of a National Information System for Science and Technology (NISSAT). The new service will be developed on the existing infrastructural facilities at CLRI. It will include industry-oriented services both at the

personalized and general levels, strengthening of library resources and facilities, development of a technological information bank, translation services and reprographic and printing facilities. UNIDO has contributed more than Rs 6 lakh towards reprographic and printing equipment.

A souvenir entitled '25 Years of CLRI' was released on the occasion. The souvenir contains, among other things, the genesis of CLRI, its set-up and mode of functioning, its achievements over the last 25 years, and a few articles on demand of leather goods in international markets, designing and developing leather machinery and equipment, etc.

Silver jubilee medals were given away by Dr Malcolm S. Adiseshiah, Vice Chancellor of the University of Madras.

A tanners' get-together and an international leather fair were among the other functions organized to coincide with the silver jubilee celebrations. A children's footwear and foot health show was organized on 2 February.

CLRI and its Activities

Since its inception on 15 January 1953, CLRI has developed from a small beginning into a research centre engaged in multifarious activities concerned with leather and allied industries. Projects tackled currently by CLRI are spread over as many as 14 multi-disciplinary and inter-disciplinary areas of work, viz. raw hides and skins, slaughter-house byproducts, collagen, tanning materials, tanning and finishing, leather auxiliaries, polymers, leather trades engineering, tannery effluents and environmental biology, footwear and leather goods, technical training, economics, extension services, and industrial information and liaison services. The research work of the laboratory covers both the fundamental and applied aspects and is done in close collaboration with the Indian leather and allied industries and academic and technological institutions. The institute has five regional extension centres, and has proposals for further expansion, to

act as the focal points for the 'show-how of the know-how' and to attend to the problems of the industry. A Leather Goods Demonstration-cum-Training Centre has been set up at CLRI with UNDP assistance.

The institute has provided assistance to other countries under the auspices of the United Nations organizations like FAO, UNIDO and ILO and has trained personnel from many developing countries like Nigeria, Philippines, Burma, Afghanistan, ARE, Sudan and Cameroon in addition to Indian personnel (more than 1000 till date) to man the industry. It has taken part in exchange programmes with many countries for mutual benefit. Eminent scientists and technologists from other countries have worked as visiting professors or experts at the institute. Also, the institute has established close collaboration in research work and other activities with a number of institutions and universities in other countries.

CLRI organizes during the 'leather week' (organized every year from 31 January to 6 February) an international leather fair, tanners' get-together, special lectures and seminars, which bring together scientists, technologists, tanners, manufacturers and others connected with the science and techno-

logy of leather, leather goods and footwear and various other aspects like economics, marketing, management and information.

Tanners' Get-together

The main theme of the 13th tanners' get-together, organized by the laboratory in collaboration with a number of other organizations, was 'Leather Auxiliaries'. Thirty-five papers were presented in the get together, which had three technical sessions, including a 'views forum' where technical, commercial and policy matters of CLRI were discussed. The get-together exposed the R & D efforts of the laboratory for critical scrutiny by the delegates, both Indian and foreign, and enabled proper feedback to the system.

The international leather fair, 15th in the series, and held from 31 January to 6 February 1978, had good response from the industry and trade from overseas countries and is expected to increase the export of finished leather and leather goods.

This year's fashion parade highlighted the use of leather in a wide variety of ways right from meeting the needs of the villagers and the tribesmen to those of the most sophisticated and exacting requirements of the space age.

Seminar on Science News Service

The need for establishing a national science news service in the country to handle and disseminate science news which could be used by mass media like newspapers, radio and television was strongly felt by the 70-odd delegates to the all-India seminar on Science News Service held at the Bose Institute, Calcutta, on 11 and 12 March 1978. Organized by the Indian Science News Association (ISNA), Calcutta, in collaboration with the Council of Scientific & Industrial Research and the Department of Science and Technology, the seminar, after its two-day deliberations, constituted a steering committee under the aegis of ISNA to frame guidelines for the formation and functioning of the service. It was re-

commended that the steering committee would dwell in particular on the following aspects: specific guidelines for handling straight news and investigation stories; stock of national and international science news sources; coordination between science news service and science news sources; users of science news; manpower to handle the operation of the service—writers, correspondents and reporters; and finances. The committee was expected to prepare a list of science writers of India (in English and regional languages) and to maintain coordination with them for handling science news.

Dr S.K. Mukherjee, Vice Chancellor of Calcutta University, who inaugurated the seminar, stressed the need for

the formation of a science news service for proper collection, interpretation, processing and distribution of science and technology news. Speaking at the inaugural function, Dr D. N. Kundu, Director, Saha Institute of Nuclear Physics, Calcutta, discussed the deficiencies of the present system in the dissemination of science news and hoped that the lacunae would be filled by the formation of a national service meant exclusively for this purpose. The inaugural function was presided over by Prof. P. K. Bose, Head of the Department of Statistics, Calcutta University.

Shri Y. R. Chadha, Chief Editor, Publications and Information Directorate (PID), in his keynote address, stressed the need for a suitable machinery for the creation of public understanding of science, and reviewed the past efforts in the country for narrowing the communication gap between the scientists and the journalists. He indicated the possible financial resources for such a service and suggested organizational steps like identification of a suitable existing agency that could be entrusted with the responsibility, and enlisting the cooperation of apex science bodies, learned societies, etc. He assured PID's full support in this venture.

Thirty papers were presented in the three technical sessions on (i) Basic challenges for handling science news, (ii) Basic operational problems relating to science news service, and (iii) Development of a science news service. Two papers were contributed by the delegates from PID: (i) Raising the public understanding of science through the mass media: Some suggestions—by Shri S. Arunachalam; and (ii) Science news dissemination through mass media: Present trend and future prospects—by Dr D. C. Goswami.

The plenary session of the seminar decided to request ISNA to frame a pilot project of two years' duration to handle science news for the mass media and to examine the impact of this service. It also recommended that science journalism should be included

in the journalism courses of the universities. ISNA was expected to cooperate with the authorities willing to introduce such courses in regard to determining the approach and content of such courses and availability of personnel for teaching science journalism.

The proceedings of the seminar are expected to be brought out soon. Copies of the proceedings may be had of Shri Samarjit Kar, Convener, All India Seminar on Science News Service, Indian Science News Association, 92 Acharya Prafulla Chandra Road, Calcutta 700009.

Indian Journal of Pure & Applied Physics

Raman Effect Golden Jubilee Number Released

The Raman Effect Golden Jubilee Number of *Indian Journal of Pure & Applied Physics* published by the Publications and Information Directorate (PID), New Delhi, was released by Dr A. Ramachandran, Secretary, Department of Science & Technology, and Director General, Scientific & Industrial Research, at a function held at PID on 22 March 1978.

The special number contains three review articles and 36 papers contributed by scientists from 12 countries on Raman spectroscopy, laser Raman studies, lattice dynamics, and chemical physics. Also included in the issue are the first communication to *Nature* (31 March 1928) on the new type of secondary radiation (which later came to be known as Raman effect), Prof. Raman's Nobel lecture on the molecular scattering of light, and a few photographs including the photograph of the first Raman spectrograph.

In his address, Dr Ramachandran dwelt at length on the significance of Raman's discovery, mentioning the extension of its application from physics and chemistry to almost every discipline including biology, medicine and space science. The introduction of the laser technology during the last 16 years has revolutionized the role of

Raman spectroscopy and vastly diversified its application, he observed.

One of Prof. Raman's students Dr L. A. Ramdas, who spoke on the occasion, paid rich tributes to Prof. Raman's seminal contributions to the cause of science and his catalytic action in galvanizing Indian scientists into top-ranking active groups.

Shri Y. R. Chadha, Chief Editor of PID, gave a brief account of the activities of the directorate and commented that the special number of *Indian Journal of Pure & Applied Physics* would not only be a commemorative volume but also a reference manual for the workers on Raman effect.

The special issue (xvi+pp 294) is supplied at no extra cost to regular subscribers of the journal for 1978 (annual subscription—Rs 100.00 or £ 16.50 or \$ 42.00). Copies of the special issue are available at Rs 25.00 (or £ 4.00 or \$ 10.00) per copy. Orders may be placed with: The Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Development of Oceanographic Instruments : NIO

The National Institute of Oceanography (NIO), Goa, has taken up a project on the development of oceanographic instrumentation. Sponsored by the Electronics Commission with a financial assistance of Rs 9.19 lakh, the project envisages the fabrication of (i) wave telemetering buoy; (ii) multi-parameter buoy telemetry system; and (iii) CSTD (conductivity, salinity, temperature and depth recorder) system.

The wave telemetering buoy is to be designed for the acquisition of data on waves for use in ports and harbours and for offshore oil-drilling rigs.

The multi-parameter buoy telemetry system is to be designed for acquiring various marine environmental data such as air temperature, water temperature, wet bulb temperature (for estimating humidity), salinity, wave height and period, current intensity and direction, wind intensity and direction.

Both the systems will be operated by suitable, moored buoys provided with necessary sensors and electronics. Data will be transmitted from the buoys on command at regular programmed intervals and these will be received at the shore laboratory for display and processing.

The CSTD system is to be fabricated for continuous measurements of salinity and temperature at any depth. The basic sensors proposed to be used are 4-electrode conductivity cell, copper resistance thermometer and strain gauge diaphragm for simultaneously sensing salinity, temperature and depth.

Study of Metal Porphyrin Complexes in Petroleum Crudes

Increased energy requirements and rapidly depleting resources of petroleum have led to increased demand for heavier ends. For an intensive and efficient processing of these heavier ends, a thorough knowledge of their constitution is essential. One of the important groups of constituents associated with these heavier ends is porphyrin metal complexes. Studies on the isolation of individual metal porphyrin complexes from Darius crude and elucidation of their structures were made by Miss S. Chakraborty under the guidance of Dr V. K. Bhatia at the Indian Institute of Petroleum, Dehra Dun. Darius crude was chosen as it has the highest metal content among the crude oils currently being processed in India. Vanadium and nickel porphyrin complexes concentrates were prepared from asphalt of Darius crude. Three individual vanadium porphyrin complexes were isolated from the concentrates. The vanadium porphyrin complexes isolated on similar lines from the de-asphalted oil were compared with those obtained from asphalt and were found to be identical. Fraction IBP-140°C was free from these complexes. Attempts were also made to isolate individual nickel porphyrin from asphalt; de-asphalted oil did not contain nickel porphyrin complexes. As

the complexes decomposed during the process, they could not be isolated. The structures of the individual vanadium porphyrin complexes from the asphalt were studied using instrumental techniques like visible, IR and NMR spectroscopy. The presence of highly alkylated and carboxylated porphyrins was indicated.

The role of vanadium and nickel porphyrin complexes in the interfacial tension of the crude oil was studied. Both these constituents were found to be interfacially active; nickel complexes were more powerful than their vanadium counterparts. A probable method of removal of these complexes from different feedstocks has also been suggested on the basis of decomposition of these complexes in the presence of carbon tetrachloride and light.

Miss Chakraborty was awarded the Ph.D. degree in chemistry of the Meerut University for her thesis based on these studies.

Eastern India Science Camp

The 1978 Eastern India Science Camp was organized at the Birla Industrial & Technological Museum (BITM), Calcutta, from 19 to 26 February 1978 in collaboration with the education directorates of the eastern states. Students and teachers from Assam, Bihar, Orissa, West Bengal, Nagaland, Meghalaya, Arunachal Pradesh, Tripura, Manipur and Mizoram participated in the camp.

The science camp programme included, among other things, the following activities: (1) An inter-state science exhibition in which 301 participants from 117 schools and science clubs took part with 250 models and projects; (2) Work experience programme where, under the expert guidance of scientists and engineers, the students were provided both theoretical knowledge and practical training on project works relating to electrical power lines, sewing machines, health care and first-aid methods, etc. in the respective camp units; and (3) Popular lectures on 'Some pleasures and horrors of

chemistry' and 'Glimpses of the Himalayas'. Special film shows on scientific subjects, an educational tour and a science quiz contest were also organized during the camp.

Some of the models and exhibits displayed in the science camp related to: water siphon clock, garbage wattage, wood distillation, lac industry, wooden printing press, extraction of essential oils, mini gobar gas plant, marsh gas detector, sound-operated door, *sarbat* machine, and pulse counter.

With a view to encouraging the participants, six scholarships including five CSIR scholarships, two challenge trophies and 40 prizes were awarded to the winners.

PROGRESS REPORTS

CMRS Annual Report : 1976-77

The annual report of the Central Mining Research Station (CMRS), Dhanbad, for 1976-77, brought out recently, shows that the activities of the laboratory were directed towards solving the problems of the mining and allied industries. The laboratory had on hand 342 sponsored projects of which 200 projects were sponsored during the year. Work on 161 projects was completed. Besides sponsored projects, the laboratory investigated 23 in-house projects, nine grant-in-aid projects and one inter-laboratory project. Know-how for 20 processes/products was released for commercial exploitation.

A compressed air grouting machine has been developed to grout roof bolts in the drill holes. This method of grouting, tried at Moonidih colliery, has been found to be very fast and economical.

The Eastern Coalfields Ltd (ECL) has planned two inclines to enter into a coal seam from surface where the soil cover is loose and plastic in nature. CMRS conducted investigations to work out the design of support parameters for the inclines, and suggested hinged parabolic arch-type support. This would further reduce the cost by 30%.

Investigations have been conducted to study the behaviour of supports and surrounding strata in Kazimers block of Sudamdih shaft mine where extraction of thick and semi-steep seam is being done by longwall system of horizontal slicing in ascending order with hydraulic sand stowing. It has been recommended that the stability of wedge formed between the roof at faces and longwall should be increased by either increasing the angle between the roof at faces and longwall or improving the efficiency of stowing towards hanging wall side. The best alternative layout of faces should be obtained by model studies. The gate roads in the panel should be driven for minimum life of requirement as the condition of most of these roads deteriorates with time. These roadways should be supported with yielding steel props as the convergence rate is generally high. The lag between faces in the subsequent lift should not be less than 16 m.

The stability of three Kamora workings of Sudamdih mine has been assessed elastostatically to determine the safety factors of the roof as well as of rib pillars with a view to finding out the possibility of failure of the pillars causing release of gas into the workings.

At the instance of ECL, a design of hydraulic stowing plant, which would be used during depillaring of Hatnal seam at Sodepur Colliery, was supplied.

Two cheap, safe and efficient powdery type non-permitted explosive compositions were developed. One of these compositions was non-cap sensitive and the other was cap-sensitive. The shelf-life of one non-permitted type of explosive composition, developed earlier at CMRS, was determined on request from FCI. The explosive retained its cap sensitivity even after six months of its preparation. The know-how for the preparation of the composition was passed on to the sponsor for commercial exploitation.

The Jhingurda seam of the Singrauli coalmine is greatly prone to auto-oxidation and it takes hardly a week's

exposure to catch fire. At the request of the management of Singrauli coalmine, a simple method of hindering initiation of auto-oxidation has been evolved. An emulsion of tar and burnt mobil is sprayed over coal surface to give a coating of 1-2 mm. This coating withstands the exposure for at least six months. However, re-coating is necessary from time to time to prevent exposure of fresh coal surface formed. The coated areas should be safeguarded against contact with active fire and accumulation of loose fines should be avoided.

A surface diesel locomotive has been converted to flameproof locomotive by CMRS in collaboration with the Moira group of collieries of ECL for use in underground gassy coalmines. The entire intake and exhaust systems have been modified and a cut-out device has been incorporated for shutting down the engine automatically if the water level falls within the conditioner box. It is now operating in the underground successfully.

At the request of the ECL and Bharat Coking Coal Ltd, an investigation into the ventilation problems has been completed at Chinakuri and Sudamdih mines. It is found that the major ventilation difficulties at Chinakuri are because of high resistance of mine and high temperature of the ventilating air. A suitable ventilation arrangement without the use of artificially cooled air was worked out. For satisfactory air quantity distribution in the mine, a larger-capacity fan at surface and two booster fans underground have been recommended. Studies for planning of ventilation of future workings and air quantity requirement of Sudamdih mine reveal that an additional upcast shaft will be necessary to improve ventilation standard.

A complete communication system for use in mines was developed by CMRS. Based on this know-how, one unit was manufactured and installed in Moira coalmine of ECL by Westing House Saxby Farmer Ltd of Calcutta. It has the facility for loud

hailing, indication of 'on' and 'off' conditions for all mine machinery, and digital display of loaded and empty tubs in mines, loaders working underground, etc. at the central despatcher board. This system also incorporates a manually operated exchange with sound-powered telephones for use in underground mines.

A new grouting device consisting of a pipe and a piston with an arm of suitable length has been developed for grouting rock bolts, cables and cellular rod. Another notable feature is that a very deep hole in any direction can be filled up for better anchorage capacity. Moreover, it has eliminated the use of wire-mesh and perfo sleeve in roof bolting and rope stitching.

A special type of pulling device for anchorage testing of roof stitching, and bamboo bolts as well as wooden bolts has been developed.

A signalling system for haulage in mines has been developed in which the use of conventional cylindrical permanent magnet for the bell has been eliminated. A prototype of the equipment has been fabricated and has been found to give satisfactory performance.

A study was undertaken to assess the extent of skin mycosis prevalent among coalminers and the sources of its origin. In all, 2527 persons comprising miners and non-miners of identical socio-economic conditions were examined, and it was observed that 35.29% of miners had fungus infection on the skin, whereas the percentage of non-miners afflicted with it was 18.6. Such infection was found to a greater extent with underground miners than with surface workers.

A field laboratory was opened at Chasnala coalmine during de-watering.

Three patents relating to (i) thermistor velometer, (ii) process for the preparation of hydrocarbon vapour detector tube for high boiling petroleum products, and (iii) process for the preparation of a detonator cap-sensitive explosive composition were filed. Ten research papers were published.

Completed Schemes Mode of Action of Vitamin A

The pioneering work on the isolation from human plasma of a specific vitamin A (retinol) binding protein (retinol binding protein, RBP), present generally as complexed RBP in association with thyroxine binding pre-albumin (PA), triggered extensive investigations on the molecular mechanism of vitamin A transport and distribution. The efforts of various investigators to establish the universality of the mechanism of transport of vitamin A via a carrier protein led to the characterization of complexed RBP in primates and aves. Shri K. Sreekrishna, a CSIR research fellow, working at the Indian Institute of Science, Bangalore, took up investigations with the aims of (i) establishing the mechanism of vitamin A transport in terms of complexed RBP in various animal species, particularly ruminants; (ii) expressing quantitatively the specificity of the interaction between apo-RBP and retinol in terms of thermodynamic and kinetic parameters; and (iii) understanding the role of PA in the modulation of retinol-RBP interaction. The studies were made under the guidance of Prof. H. R. Cama, Chairman of the Department of Biochemistry.

Sreekrishna purified PA-RBP from goat plasma by repeated chromatography on DEAE-sephadex, gel-filtration and immuno-affinity chromatography on antigoat serum albumin-sepharose-4 B. The homogeneous complexed RBP had a molecular weight of 75,000 daltons and was devoid of any carbohydrate moiety. Both on electrophoresis and in the presence of 2M urea, complexed RBP dissociated into RBP and PA. RBP so obtained had a molecular weight of 20,000 daltons. It exhibited microheterogeneity on electrophoresis and migrated in the α -region (relative to albumin). The physicochemical properties of goat

RBP, such as molecular weight, electrophoretic behaviour, and ultraviolet and fluorescence spectra, compared well with those of other RBPs. Goat PA (mol. wt, 55,000 daltons) was dissociated on SDS-electrophoresis into subunits of molecular weight 26,000 and 13,000 daltons respectively. It exhibited affinity towards L-thyroxine and RBP as evidenced by the quenching of protein fluorescence at 340 nm upon addition of L-thyroxine or RBP. Further, the presence of RBP did not inhibit the binding of L-thyroxine to PA and vice versa.

The physicochemical behaviour of the complexed RBP isolated from goat plasma was compared with that present in other ruminants (viz. those of cow, buffalo and sheep) as well as in other animal species (viz. primates, rodents, aves, and amphibians). Despite the similarity in the physicochemical behaviour, RBP and PA were immunologically species specific. RBP of one animal species was able to interact and form a stable complex with PA of a different species. In the various animal species tested, complexed RBP was shown to be present in the whole plasma. But, the behaviour of protein-bound retinol (PBR) on DEAE-sephadex chromatography differed significantly, depending on the animal species. In the human, PBR was eluted after the serum albumin peak; PBR from goat, sheep, buffalo and chicken were eluted immediately after the major peak of albumin; while in the cow, PBR was eluted prior to albumin and in the rat it was eluted along with albumin. These differences were mainly attributed to variations in the RBP binding protein rather than in the RBP *per se*. Human PA had the highest electrophoretic mobility followed by those of chicken and goat, when subjected to electrophoresis on 7.5% polyacrylamide gel at a pH of 8.6.

Quantitative estimations of the thermodynamic and kinetic parameters of

the retinol-protein interaction were carried out in two different ways: (i) equilibrium partition between aqueous buffer and *n*-heptane, and (ii) fluorimetric titration of apo-RBP with retinol. In the first method, the association constant K_a was calculated from the limiting value of the extent of retinol dissociation from the holo-protein and the partition coefficient of retinol between *n*-heptane and the phosphate buffer. In the second method, the binding of retinol to RBP resulted in the enhancement of retinol fluorescence at 470 nm and this was used to evaluate K_a . Both the methods gave nearly identical results. The K_a values of $10^8 M^{-1}$ and $10^9 M^{-1}$ (both in 20 mM potassium phosphate buffer, pH 7.6, containing 0.2 M NaCl and at $26 \pm 2^\circ C$) were obtained for retinol-RBP (human and goat) and retinol-complexed RBP (goat), respectively. This suggested that PA enhanced the affinity of retinol to RBP by 10-fold. The K_a values for the interaction of retinol with albumins (viz. bovine serum albumin and ovalbumin) were evaluated from the fluorimetric titration method in which either the enhancement in the retinol fluorescence at 470 nm or the quenching in protein fluorescence at 340 nm upon binding of retinol to the protein was made use of to calculate the binding constant. K_a values thus calculated were 30-200 fold less than that for retinol-RBP interaction. The $t_{1/2}$ (time for 50% dissociation) and k_d (dissociation rate constant) were evaluated to be 16 sec and $4.6 \times 10^{-2} \text{ sec}^{-1}$ respectively, for retinol-RBP (goat) interaction. This was not altered in the presence of PA, suggesting that PA probably increased the uptake rate of retinol by RBP.

Sensory Role of Poison Fang

In a CSIR-supported research scheme being investigated by Dr B. S. Jangi (Editor, *Indian Journal of Experimental Biology*, and *Indian Journal of Biochemistry and Biophysics*) of the Publications & Information Directo-



Scanning electron microscope picture of a centipede poison fang ($\times 42,250$)

rate, New Delhi, and Prof. C. M. S. Dass of the Department of Zoology of the University of Delhi, it has been shown, for the first time, that a poison fang besides killing the prey is used as an organ of taste. Their study with a scanning electron microscope has revealed that the centipede fang bears on its surface a scatter of sensory receptors in the form of conical projections, each of which is lodged in a pit and bears at its tip a depression where its wall is apparently delicate and pervious to chemical stimuli. When these receptors were stimulated, in a detached head, by glucose solution, it always resulted into feeding reflex involving a characteristic movement of the mouth parts [*Indian J. exp. Biol.*, 15 (1977), 803]

PERSONNEL NEWS

Appointments/Promotions

Dr K. J. Scaria

Dr K. J. Scaria has been appointed, on promotion, Scientist EI at the Central Leather Research Institute (CLRI), Madras, with effect from 12 October 1977. Dr Scaria (born 15 March 1929) graduated from the University of Madras in 1950 and did his M. Sc. (1954) from the University of Saugar. He joined CLRI in 1955 as a research assistant. Working there on vegetable tannins, he obtained his Ph.D. (1962) in chemistry from the Madras University.

Dr Scaria has carried out extensive studies on the physicochemical properties of vegetable tannins in relation to the mechanism of vegetable tanning. He has developed a tannin-based mud thinner for use in deep oil well drilling. Since 1962 he is associated with various research projects on the utilization of tannery and slaughter-house byproducts. He is heading the Animal Byproducts Division.

In 1975 Dr Scaria worked in Burma for about three months as a consultant and team leader in an S. I. S. Mission under FAO on hides and skins improvement and animal byproducts utilization. He was FAO consultant at the Leather Research and Training Institute, Pendik, Turkey, for two months in 1976. He has taught leather technology at B. Tech. and M. Tech. levels for 15 years.

Dr Scaria was a member of the task force on abattoirs and animal products set up by CSIR. He is a member of the Food and Food Products Committee of the Indian Standards Institution. He is recipient of the NRDC invention award for his process relating to the production of exotic leathers from cattle stomach linings, and has 23 research papers to his credit.

Dr S. K. Gupta

Dr Sudhir Kumar Gupta of the Central Drug Research Institute (CDRI), Lucknow, has been promoted as Scientist E II with effect from 23 January 1978.

Dr Gupta (born 31 May 1923) graduated from the King George's Medical College, Lucknow, in 1946, and on being awarded a U. P. government scholarship, he took his diploma in public health in 1948 from the All India Institute of Hygiene and Public Health, Calcutta. Dr Gupta served for some time as a district medical officer of health in the Medical & Public Health Services, U. P., before he joined CDRI in July 1952. After getting his D. Phil. (medical) from the Calcutta University in 1957, he proceeded to UK under the Colombo Plan to work

in some of the leading medical laboratories, viz. Guy's Medical School, London; Department of Tuberculosis, Edinburgh University; Glaxo Laboratories, Middlesex; The Royal Post-Graduate Medical School, Hammer-smith; Tuberculosis Reference Laboratory, Cardiff; and the Department of Pathology, University of Aberdeen.

At CDRI Dr Gupta has contributed significantly to the development of a new antitubercular drug (of American Cyanamide) called Ethambutol (also known as Myambutol). He has also discovered a photochromogenic mycobacteria with a vaccinal potency higher than that of the standard BCG.

From 1968 to 1974 he headed in collaboration with Dr Betty Jane Abbott the 22nd screening laboratory (stationed at CDRI) of the National Institutes of Health. Along with his associates, he has developed an economical process for peptone and meat extract, which is being commercially exploited by Nath Laboratories, Hyderabad. Antibiotic X-63 developed by his team in collaboration with Unichem and UCB, Belgium, has proved useful against vaginal candidiasis. Other significant contributions made by Gupta and his associates relate to the development of a nonspecific vaccine against candidal infection from *Streptococcus faecalis*, and (ii) a new vaccine *M. marinum* (Murohashi) against Buruli ulcer in rats and mice.

Dr Gupta has to his credit more than 60 research papers.

Dr S. S. Mukerjee

Dr S. S. Mukerjee of the Central Drug Research Institute, Lucknow, has been promoted to Scientist EI with effect from 1 December 1977.

Dr Mukerjee (born 18 Sept. 1931) obtained his M.B.B.S. from the Calcutta University in 1955. After working as a resident house medical officer at M. R. Rangur Hospital, Calcutta, he joined CDRI as a senior research fellow in November 1959.

His initial work in the division of experimental medicine was on liver

function tests. He standardized a method of studying the detoxicating mechanism in the liver of rabbits with sodium benzoate. Later, he studied the influence of psoralen and imperatorin in both antileucoderma drugs (extracted from plants in the institute) on the liver functions.

Mukerjee's work on obesity in experimental animals led to his being awarded a D. Phil. (medical sciences) degree in 1964. To pursue further studies on obesity, he went to McGill University, Montreal, Canada, and worked on the life-span of fat cells for a year and a half (1969-70).

Dr Mukerjee was engaged in studying the mechanism of action of Centipiperalone, a unique anti-diabetic compound discovered and synthesized at CDRI. He also studied the chronic toxicity of this compound as well as of Centchroman, an anti-fertility compound, in monkeys.

At present Dr Mukerjee's research interest is on the cause of the increased incidence of atherosclerosis in diabetes mellitus. With the initial few experiments he has been able to show that the mechanism of action of insulin could be in the aortic tissue. He has conducted this programme as a convener for screening of compounds. Till now about 2000 compounds and extracts have been screened. He also screens compounds and extracts for plasma clearing activity.

Dr Mukerjee has about 30 publications to his credit.

Obituary

Shri P. K. Thomas (57) Storekeeper (Special Grade) of the Madras zonal laboratory of the National Environmental Engineering Research Institute, Nagpur, expired (5 March 1978).

PATENTS FILED

59/Del/78 : A process for the preparation of new yellow-to-red azo-N-substituted-6-substituted aminopyridone disperse dyes for synthetic fibres, N. R.

Ayyangar, A. D. Deshpande & B. D. Tilak—NCL, Poona.

60/Del/78 : A process for the preparation of new yellow-to-orange azo-N-substituted-6-chloropyridone disperse dyes for synthetic fibres, N. R. Ayyangar, A. D. Deshpande & B. D. Tilak—NCL, Poona.

61/Del/78 : Air spore sampler with inclined slide, S. U. Deshpande & S. D. Wachasunder—NEERI, Nagpur.

Administrative Management Programme in R&D: NCL, Poona

A ten-day training programme on Administrative Management for senior and middle-level administrative personnel from the administrative wing of the

national laboratories is being organized by the Management Development Unit of CSIR's Planning Division. The course will be held at the National Chemical Laboratory (NCL), Poona, from 25 May 1978, and will cover organizational development, personnel management, O&M, and topics connected with the efficient performance of the persons concerned. Tailored to suit the administrative needs of middle-level administrators in a research organization, the programme is open to administrative personnel in R&D and educational organizations outside CSIR also. Further details may be obtained from Shri S.R. Vasist, Training Officer, Management Development Unit, Planning Division, CSIR, Rafi Marg, New Delhi 110001.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 5/78

It is proposed to appoint a Scientist F (Deputy Director) for the Central Electronics Engineering Research Institute, Pilani (Rajasthan).

Job Requirements : This is a senior research management position and the incumbent will be required to provide high-level leadership to formulate, plan and guide research and developmental activities in electronics, with special reference to electronic circuits. He will identify technological problems and offer assistance in the transfer of technology and developmental activities to concerned organizations. He may also be required to assist the Director in planning and execution of projects and in such other matters as may be assigned to him.

Qualifications : Essential : High academic qualifications in electronics, preferably doctorate degree with extensive experience of research and development in electronic circuits (e.g. audio engineering, communications, TV systems, electronic instrumentation, controls for industrial electronics). **Desirable :** (a) Impressive record of published work, or (b) experience of management of research, industry or technology transfer, in the field of electronics.

Salary/Conditions of Service : The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years (including the period of probation) after successful completion of a probation period of two years. Other conditions of contract will be supplied on request.

Age Limit : Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain six copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma should be received in this office on or before 18 May 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

C.F.T.R.

Symposium on Modern Trends in Plant Taxonomy

A four-day symposium on Modern Trends in Plant Taxonomy was organized by the National Botanic Gardens, Lucknow, from 6 to 9 March 1978. The symposium was supported by the Biological Research Committee of CSIR, the Department of Science and Technology, University Grants Commission, Indian National Science Academy, Botanical Survey of India, and Banaras Hindu University.

The deliberations of the symposium, spread over 12 sessions, highlighted the importance of plant taxonomy as a mother science for making a proper assessment and full utilization of the country's plant wealth, ranging from micro-flora like algae and fungi through liverworts, mosses, ferns and conifers to angiosperms and crop plants. The symposium also discussed the role of computer, phytochemistry, biochemistry and plant physiology in taxonomy, and taxonomy of cultivated plants.

In all, thirty research papers were presented by 42 botanists. The following are the recommendations:

1. An overall assessment of the conservation status of the various ecosystems and plant communities of India and of individual species which are endangered should be made with a view to establishing and implementing a conservation strategy.
2. Steps should be taken to survey and assess, in association with appropriate specialists in applied fields, the rich plant genetic resources of the country

and to implement a programme of action to establish gene banks and reserve living collections.

3. Work on preparation of a national flora and on the preparation of regional floras of all groups of plants should be intensified.

4. In view of the great economic, ecological and academic importance of cryptogams (pteridophytes, bryophytes, fungi, lichens, algae), taxonomic and systematic research on these groups should be intensified and extended. This should include the establishment of herbaria and culture collections for algae and fungi.

5. In view of the shortage of taxonomic specialists, serious consideration should be given to the setting up of training centres attached to universities and in association with appropriate national institutes.

6. Attention should be given to establishing centres for electron microscopy, phytochemistry, and computing and data processing to facilitate taxonomic research.

7. Teaching of taxonomy in the universities should be strengthened and developed, using modern approaches such as biosystematics, and molecular, fine structural and numerical and computer studies, and biochemical systematics.

8. Work on the taxonomy of cultivated plants should be intensified and monographs on Indian cultivated plants prepared on modern lines following the

Cultivar Code (International Code of Nomenclature of Cultivated Plants).

9. Data banks should be established and publications should be brought out in order to make readily accessible the very large and rapidly growing body of data on chromosomes, pollen and spores, cuticular and epidermal features, fruits and seeds, anatomical and embryological features.

10. Ethnobotanical research in India should be strengthened and museums of ethnobotanical material established.

11. Herbaria and associated libraries should be adequately housed, curated and staffed so as to make the enormous body of data and information readily accessible for consultation and research.

12. The role of botanic gardens as resource, conservation and public education centres should be recognized and steps taken to establish further botanic gardens on modern lines.

13. Representative voucher specimens and slides, properly labelled plant materials and plant parts examined in systematic botanical studies (chromosomal, palynological, embryological, anatomical, cuticular and epidermal, phytochemical studies, etc.) should be deposited at recognized centres and herbaria and conserved as reference collections for future studies. Also, the source of the material and location of voucher or other specimens examined should be cited in any new publication.

14. Funding agencies should take cognizance of the above recommendations and make adequate provision for their rapid implementation.

The symposium was inaugurated by Prof. V.H. Heywood, Head, Department of Botany, University of Reading, England. The inaugural function was presided over by Prof. A.K. Sharma, Ghosh Professor of Botany, Calcutta University, Calcutta. Dr Keith Jones, Head Jodrell Laboratory, Royal Botanic Gardens (RBG), Kew, read a message of the Director of RBG on the long-standing cooperation between the Royal Botanic Gardens and the National Botanic Gardens. The Director of NBG, Dr T.N. Khoshoo, delivered the welcome address.

CRRI Celebrates Silver Jubilee

The Central Road Research Institute (CRRI), New Delhi, celebrated its silver jubilee on 10 and 11 March 1978. The celebrations included a seminar, opening of the new building of the Traffic Engineering Division, a get-together of CRRI and other user organizations of road research, an exhibition on CRRI's achievements, and an 'open day'.

Inaugurating the silver jubilee function, Dr P.C. Chunder, Union Minister of Education & Social Welfare, and Vice President of CSIR, stated that the development of village roads should not be lost sight of in our preoccupation with urban roads. He emphasized the need for improving bullock-cart and

rural road communications in the context of the agrarian economy of the country.

Dr A. Ramachandran, Secretary, Department of Science & Technology, and Director General, Scientific & Industrial Research, in his welcome address, cited the institute as a shining example of putting into practice the modern concept of systems engineering, where wide-ranging categories of personnel, such as civil and highway engineers, electronics specialists, physicists, chemists, geologists, statisticians, and economists, worked in unison to devise ways and means of making roads cheaper, better and safer. In his presidential remarks, Dr Atma Ram, Chairman, National Committee on Science and Technology, emphasized the dire need for constructing all-weather rural roads, and also for establishing a very close coordination and interaction between the research scientists and the user organizations for an effective and timely utilization of the results of research. Earlier, Prof. C.G. Swaminathan, Acting Director of CRRI, gave a resume of the achievements and activities of the institute over the last 25 years.

Achievements

Since its inception 25 years ago, the institute has identified and completed work on more than 500 need-based research projects concerning solutions

to actual road design, construction and maintenance problems encountered in the different regions of the country, covering a wide range of geological, climatic, topographical and traffic conditions. With the large infrastructure of facilities, rich experience and abundant expertise built up over the years, the institute has advised and assisted several road construction agencies in the country and has tackled for the benefit of the profession over a thousand difficult field problems representing different facets of highway engineering and related fields, including foundations of sensitive structures on troublesome grounds like soft clays and loose sands, landslide correction in the Himalayan regions, bridges, road and airfield pavements, rural roads, and traffic and transportation engineering. The institute has evolved new economical techniques for the construction of durable roads, which have already found large-scale implementation in the road development plans of the country. More than 2000 in-service highway engineers from various user organizations such as the Central Public Works Department and state public works departments, Engineer-in-Chief's Branch of the Ministry of Defence, Border Roads Development Board of the Union Ministry of Shipping and Transport (Roads Wing), and municipal corporations have been trained by the institute in the methodology of application of these techniques and to keep them abreast of the latest developments in the field of highway engineering.

The basic document prepared by the institute enlisting its past and present activities as well as future aspirations provided a framework for discussion at the seminar on 'The role of research in road development'. The purpose of the discussions, as spelt out by Prof. Swaminathan, was to elicit the views of the participants and the beneficiaries of research on the trends of present research at the institute, so that these



Dr P.C. Chunder, Union Minister for Education & Social Welfare, inaugurating the silver jubilee function

could be kept in view while formulating its future research plans. Shri Chand Ram, Union Minister of Shipping & Transport, while inaugurating the seminar, commended the work of the institute, particularly its consultancy services, which formed a convenient channel for technology transfer.

The main purpose of the get-together was to determine how best the fruits of the proven research results could be taken to the actual field constructions and to identify and eliminate the stumbling blocks at various levels in technology transfer. The discussions yielded many useful suggestions.

More Licensees Commence Zinc Production Based on CECRI Process

The process for producing zinc electrolytically from galvanizer's ash developed by the Central Electrochemical Research Institute (CECRI), Karaikudi, has been commercialized by two more firms, viz. G.P.P. Micrometals, Pune (capacity, 100 kg /day) and Tamilnadu Metal Industry, Karaikudi (capacity, 250 kg /day). Sethia Metals & Alloys, Bikaner, has been producing zinc using the CECRI process since March 1977.

During the galvanizing process, a considerable quantity of zinc metal gets lost as skimmings, ash and dross. Zinc ash takes away 10% of the metal consumed in the industry, and it is for recovering zinc from this waste that the process has been developed. The process consists in the electrolysis of a suspension of finely divided zinc waste in an acidic solution between lead anodes and aluminium cathodes.

NCL Technologies Released to Industries for Commercialization

Simazine and Atrazine: Processes for the manufacture of Simazine and Atrazine, developed at the National Chemical Laboratory (NCL), Poona, have been released to Amr Dye-Chem Ltd, Bombay. Simazine and Atrazine are important herbicides used for the protection

of maize, jowar and bajra crops. Atrazine, in particular, is useful in regions of low rainfall.

Nitrofen: The NCL process for the manufacture of Nitrofen has also been released to Amar Dye-Chem Ltd, Bombay. Nitrofen is a herbicide specially useful for groundnuts, sugarcane and sorghum.

Carboxin: The NCL process for the manufacture of Carboxin, a systemic fungicide, has been released to Sudarshan Chemical Industries Ltd, Poona. Carboxin is mainly used for the seed treatment of cereals against smuts and bunts, and of cotton, peanuts and vegetables against *Rhizoctonia*. It is highly specific and effective against pathogens without injuring the hosts.

Dibutyl Tin Oxide: The NCL process for the manufacture of dibutyl tin oxide has been released to Dura Chemical Corporation (P) Ltd, Bombay. Dibutyl tin oxide is mainly used in the manufacture of stabilizers for PVC.

Dichloropropionic Acid: The NCL process for the manufacture of dichloropropionic acid has been released to Gromor Pesticides Pvt. Ltd, Calcutta. Dichloropropionic acid is widely used as a selective weedicide for the control of grasses in sugarcane, sugarbeet, corn, potato, and other similar crops.

Deputation Briefs

Prof. A. Rahman, Chief (Planning), CSIR, participated as a guest speaker in an international seminar on science policy held in Brazil from 6 to 10 March 1978. The seminar was organized jointly by the National Council for Science, Technology and Development of Brazil, the International Council for Science Policy Studies and the OAS in Rio de Janeiro. The aim of the seminar was to explore how science policy could help in organizing the scientific effort in Brazil. There were seven guest speakers, three each from USA and France and one from India.

The seminar focussed the attention of the participants on the various dimensions of science policy: history of

science and its relevance; development of technology, appropriate technology and its relevance to developing countries; models for science; indicators of scientific growth and science policy making.

The relevance of Indian experience to the developing as well as advanced countries became apparent during discussion. The evolution of science policy studies and the development of infrastructure of science and technology and the approach followed in India were considered to be of special relevance to the development of science and technology in Brazil.

Handbook for Prestressed Concrete Bridges

The Structural Engineering Research Centre, Roorkee, has brought out a handbook on standardized prestressed concrete girders designed for the Indian Roads Congress (IRC) loadings. The handbook facilitates the selection of economical sections, and explains the use of standard sections.

The carriage-way considered in the handbook consists of a two-lane roadway 7.34 m wide and two footpaths, each of 1.83 m width. The pre-tensioned and post-tensioned sections are given on the basis of the recommendations of IS:1343-1965 and IRC Design Criteria for Prestressed Concrete Road Bridges (Post-Tensioned Concrete), 1965 respectively. Fillet dimensions and their slopes were kept constant within a certain range of spans to facilitate the re-use of the same form-work for different spans. The variables considered are precast concrete strength, *in situ* concrete strength, shape of the section and number of girders. For each span, the minimum weight section and the most economical section are given. Tables and charts for the analysis of bridge decks based on the Guyon-Massonnet's theory, and bending moment and shear force tables for IRC loads at central and various other span points are also given.

The handbook contains six chapters:

(1) Introduction giving general scope of the handbook with useful tables containing bending moment and shear force ordinates for two lanes of Class A and a single lane of 70 R loading and distribution coefficients for longitudinal moments and charts for transverse moments; (2) Tables for composite inverted T-beam decks; (3) Tables for post-tensioned hollow-box beam decks; (4) Tables for composite I-beam decks; (5) Tables for precast post-tensioned T-girder decks; and (6) Economic considerations and cost charts of the above types of decks.

The handbook contains 18 design charts and 119 tables giving the details of various types of sections for different spans ranging from 7.5 m to 36.0 m at 1.5-m intervals and design tables compiled by using a digital computer along with a number of design examples. The tabulated information gives the dimensions of section, the prestressing force and eccentricity at the critical section.

The handbook (29.0 x 21.5 cm) is priced at Rs 18 per copy and can be had from the Scientist (Information), Structural Engineering Research Centre, Roorkee 247 667.

Design Tables for Concrete Bridge Deck Slabs

This is a handbook brought out by the Structural Engineering Research Centre, Roorkee, with a view to helping the structural engineers engaged in the design and analysis of bridge deck slabs. Such design tables for bridge deck slabs subjected to the loads specified by the Indian Roads Congress (IRC) Code of Practice are not available.

The handbook contains 285 slab panels of practical dimensions analyzed for the IRC loadings as well as for uniformly distributed loading covering the entire slab; the analysis of uniformly distributed loading facilitates the computation for dead loads. Critical values of bending moments are

tabulated for slabs with simply supported and fixed edges. Examples to illustrate the use of the tables are also given.

The handbook is priced at Rs 15 per copy and can be had from the Scientist (Information), Structural Engineering Research Centre, Roorkee 247667.

PROGRESS REPORTS

NGRI Annual Report: 1976-77

The annual report of the National Geophysical Research Institute (NGRI), Hyderabad, for 1976-77, published recently, shows that the institute made multidisciplinary efforts for the exploration and management of groundwater, minerals, geothermal resources and investigation of the solid earth. During the year, the institute investigated 33 research projects under eleven broad areas. The financial inputs of the institute for 1976-77 amounted to Rs 115.337 lakh. The earnings from sponsored surveys, sale of instruments, consultation fee, etc. was about Rs 10.958 lakh.

Under the UNDP-aided project for development of improved geophysical techniques and instrumentation, work has been in progress to develop time domain IP equipment, bore-hole logging equipment and a VHP radio beacon for automatic updating of airborne position location system. The results of the research investigations in well-logging techniques have indicated that response of 'Lateral and Laterolog 7' devices can be synthesized from 'normal' or 'two-electrode' response. Problems in transient EM sounding over (i) multi-layered earth cross-section under cover of a conducting over-burden, and (ii) 3-layered earth with conductive /resistive intermediate layer have been studied.

Experimental resistivity surveys were carried out to locate boundary of water-logged old and abandoned mines in Raniganj coalfields. Resistivity surveys were also carried out on Nhava Island

off Bombay coast for determining the thickness of top soil and depth of the bedrock.

The institute has successfully designed and built an inverter power supply for improved performance of the rubidium vapour magnetometer developed earlier. A device to quantitatively estimate the reflectance of iron ore dust samples has been fabricated. The device will be very useful for the friability estimation of iron ores.

The first phase of integrated geohydrological studies in the Lower Maner Basin has been completed. Resistivity prospecting for groundwater in some drought-prone areas of Uttar Pradesh was carried out. Resistivity surveys have also been carried out in a 1700 sq km area of Mahanadi delta to delineate aquifers and outline saline /fresh water boundaries.

Simulation studies for groundwater management were continued. An R-C analog modelling study of aquifer systems in Krishna-Hindon interstream region was carried out using the hydrogeological data procured from the Bhabha Atomic Research Centre, Bombay. The study has indicated that the aquifer cannot sustain the present heavy withdrawal of groundwater and over the next five years the water level will further decline.

Sponsored geophysical surveys for groundwater have been carried out in different parts of Andhra Pradesh and the union territories of Goa, Daman & Diu. About 170 villages have been covered since January 1975 in this region. Altogether, 350 points have been recommended for tapping groundwater through bore-wells, or dug-wells or bore-cum-dug wells. Most of the dug- or bore-wells completed have proved to be successful. Bedrock investigations have been undertaken for Buggavanka reservoir scheme across Buggavanka river near Cuddapah, at the proposed dam site for Peddaru reservoir scheme near Madanapally and for Krishna-puram reservoir scheme near Karveti-

agar in Chittoor dist. at the request of the Government of Andhra Pradesh

Under deep seismic sounding (DSS) project, the activities extended from analyses and interpretation of DSS data obtained in Peninsular Shield and Anir-Himalaya to shooting of fresh DSS profiles in the states of Gujarat and Maharashtra.

Preliminary depth-sections along 7 sub-profiles have been obtained using reflected /refracted arrivals in Koyna area and Deccan traps along Guhagar-Jath profile. Average and interval velocity functions have been obtained from Deccan trap region of Maharashtra and effective velocity and depth nomograms developed. These will be employed to construct a final depth section along Guhagar-Jath profile.

At the request of the Oil & Natural Gas Commission (ONGC), DSS field work was carried out along a 200 km long profile running between Ahmedabad to Navasari in Gujarat. It is the first time that DSS studies are being used in a sedimentary basin to obtain deep geological information required in oil exploration programmes. Wide angle reflections have been recorded all along the profile besides near vertical reflections, at various shot points, from horizons occurring at depths of 1 to 12 km.

DSS work was also carried out in Gujarat along a 160 km long profile from Navibandar to Amreli. Besides recording wide angle reflections, clear vertical reflections were recorded at various shot points.

Studies on geothermal resources along the western coast were continued. These comprise hot springs of Konkan, Tural-Rajwadi and Unhavare (Khed) areas. It has been observed that 27 hot springs have temperatures of 27° to 58°C in Akloli-Ganeshpuri area of Thana district (Maharashtra) and a cluster of seven hot springs with temperature ranging from 41° to 61°C occur in Tural-Rajwadi area and one hot spring has a temperature of 70°C in Unhavare

(Khed) hot spring area. These geothermal waters have been chemical analyzed and studied. Thermal investigations have been carried out in Manikaran-Kasol-Jan hot spring areas and Vashishth-Kalath hot spring area of Kulu valley.

Thermal logging of 10 bore-holes in various geological provinces of India has been carried out.

Paleomagnetic studies were carried out to understand the movement of Indian Plate and various tectonic phases of Himalayan orogeny. Paleomagnetic studies have also been undertaken in Peninsular shield. In this connection, a large number of oriental samples were collected from a number of formations. Physical and elastic properties of rocks under NTP and their behaviour under high temperatures and pressures have also been studied.

Integrated geological, geochemical and geophysical studies have been undertaken in certain critical areas of the Himalaya and Peninsular India.

Geophysical data were regularly recorded in the observatories of NGRI and exchanged with other data centres for global study.

Thirty-three research papers and 17 technical reports were published during the year.

PERSONNEL NEWS

Appointments /Promotions

Dr D. Ghosh

Dr D. Ghosh of the Central Leather Research Institute (CLRI), Madras, has been appointed, on promotion, Scientist EI with effect from 10 October 1977

After obtaining B.Sc. degree from the Calcutta University and diploma and certificate in tanning from the Bengal Tanning Institute (now College of Leather Technology), Calcutta, Dr Ghosh worked for about two years at the Kanpur Tannery Ltd, Kanpur. He joined CLRI in 1953 and became a Senior Scientific Officer in 1962. Deputed to Australia under the Colombo Plan in 1957 he obtained Ph.D. degree (1960) from the University

of New South Wales for his work on the chemical nature and tanning characteristics of mangrove tannin

Dr Ghosh's work has established mangrove as a good tanning material, it was hitherto considered an inferior tanstuff in India and abroad. In 1967, he received an invention award from the National Research Development Corporation of India (NRDC) for developing an improved process for the manufacture of tanning extract from mangrove tan materials. He received another award from NRDC in 1974 for developing an economic process for the manufacture of E.I. leather (which is an exportable product) in which wattle, an imported tan material, is substituted to the extent of 50%. The wattle substitution is made mainly with myrobalam tan material, which is abundantly available throughout India, by changing the tanning system. The process has been demonstrated in major south Indian tanneries. He has recently developed a process for the quick tannage of sole leather (50-60 hr tanning) with minimum quantity of wattle extract, as a result of which the cost of sole leather production would be greatly reduced. The process has also been demonstrated. His research work has almost prevented the wastage of tan material.

Dr Ghosh has to his credit more than 50 research papers and a patent.

Honours & Awards

Drs H.K. Gupta, M.S. Bhalla, B.S. Sukhija, B.K. Rastogi, S.C. Garde and P.K. Panda of the National Geophysical Research Institute, Hyderabad, were awarded the 'Distinguished Alumni Award' by the Indian School of Mines, Dhanbad, at its golden jubilee convocation held on 12 March 1978.

Dr Hari Narain, Director, National Geophysical Research Institute, Hyderabad, has been awarded the Doctor of Science (*honoris causa*) by the Indian School of Mines, Dhanbad, at its golden jubilee convocation.

PATENTS FILED

86 Del 78: Electrochemical preparation of *p*-phenylethylamine using iron black and cobalt black cathodes. H.V.K. Udupa, V. Krishnan & A. Muthukumaran — CECRI, Karaikudi.

National Solar Energy Convention

The Central Salt & Marine Chemicals Research Institute, Bhavnagar, is organizing a national solar energy convention of the Solar Energy Society of India at Bhavnagar during 20-22 December 1978. Other collaborators in this convention are Bharat Heavy Electricals Ltd, Central Electronics Ltd, Department of Science and Technology, Jyoti Ltd (Baroda), and Tata Energy Research Institute.

The objective of the convention is to provide in-depth information in the new emerging field of solar energy, its relevance and scope in the rural development and to provide a forum for exchange of ideas among participants.

The convention will have nine sessions dealing with the following areas: (i) Photovoltaics, photochemistry, photobiology and radiation; (ii) Solar flat plate collectors; (iii) Solar concentrators; (iv) Solar thermal power system; (v) Space heating and cooling; (vi) Energy storage; (vii) Selective coatings; (viii) Rural applications; and (ix) Industrial applications.

Each session will start with an invited lecture by a specialist, who will review the state of art in the area. One session will be devoted for panel discussion. A parallel poster session is also planned for all the three days. Visits to places of importance in solar energy research and development are proposed.

A two-day pre-convention workshop has been planned on 18 and 19 December 1978 on desalination, solar ponds and solar energy for rural development. Papers accepted for presentation will be printed and distributed to the participants before the convention.

Solar energy scientists and engineers are invited to send their papers for presentation at the convention. Abstracts are to be sent immediately. The dateline for receipt of full papers is 30 July 1978.

CSIR RESEARCH COMMITTEES RECONSTITUTED

With effect from 1 April 1978, twelve CSIR research committees have been constituted for a period of three years. The membership of the various committees follows:

Biochemical, & Microbiology Research Committee

DR (MISS) B.M. BRAGANCA (*Chairman*)
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HEAD
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Biological Research Committee

PROF. A.K. SHARMA (*Chairman*)

Persons willing to participate in the convention may contact Prof. K.S. Rao, Secretary, National Solar Energy Convention, Central Salt & Marine Chemicals Research Institute, Bhavnagar 364002.

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CSIR NEWS

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Seminar on Technology and Rural Development

A seminar on 'Technology and rural development with special reference to agriculture' was jointly organized by the Department of Sociology, Haryana Agricultural University (HAU), Hissar, and the Centre for the Study of Science, Technology and Development (CSIR) at HAU on 27-28 March 1978.

Inaugurating the seminar, Shri P.S. Lamba, Vice Chancellor of HAU, commented that with the recent focus on agriculture for the uplift of the underprivileged, a deeper socio-psychological analysis of reality had become imperative. The overall impact of new technology on rural poverty, employment and growth also needed to be assessed, he said. Pointing out the inadequacy of the bulk of the western technology for removal of poverty in rural areas, Prof. A. Rahman, Chief (Planning), CSIR, in his presidential address, mentioned that for the technological development to be relevant, it must respond to the socio-economic situation of the country. He stressed that collaboration between universities and the national agencies like CSIR must be encouraged and utilized in studying the problems of development.

About 25 papers were read and discussed in the seminar, organized in three main panels. In the first panel on 'Strategies of rural development in changing social context', the concept and content of rural development were discussed. Delivering the keynote address, Prof. Rahman cited instances to bring home

the point that the problems of development would not be overcome by copying the models of development of the other countries: an indigenous approach to meet the local requirements was essential. There was a general consensus among the participants that technologies for rural areas must be of low cost, must generate employment and create an egalitarian society. Such an approach should also utilize the cultural variables and the national programmes of development for maximizing the efficiency of the rural development efforts. Specific case studies on regions, pest control and employment situation were also presented.

In his keynote address in the second panel on 'Creation of appropriate technologies, their communication and diffusion', Prof. Y.P. Singh brought out, with specific examples, that traditional and craft-based technologies in the rural areas had been ignored. Efforts must be directed to utilize these technologies which had great potential to improve the conditions in the rural areas. In case of agricultural implements alone, there was a vast scope of improving them at marginal additional cost. The need of the time was to avoid the development of high-cost and high-energy consuming technologies, he observed. A number of authors evaluated the current practice of communication and transfer of technology in agriculture. One significant finding presented was that the cosmopolite agency interaction rather than the

mass media was most effective in the process of transfer of technology.

In the third panel on 'Delivery system and management of technology for rural development', Prof. M.L. Sharma delivered the keynote address. The social, economic, cultural and political constraints of the delivery system of technology and its management in the rural areas were discussed, and people's participation, leadership correlates and demographic conditions were considered to be the most important components for the effective management of technology.

The participants felt that there was need to intensify the study of the rural environment so as to fully understand and identify the factors which would help evolve a framework conducive to the Indian villages. The framework thus arrived at was expected to provide a sound basis for undertaking programmes of rural development.

IJIRA's Ninth Technological Conference

The Indian Jute Industries' Research Association (IJIRA), Calcutta, organized its ninth technological conference at Calcutta on 28 and 29 March 1978. The inaugural session was followed by four technical sessions in which seven papers and a study group report were presented.

In their paper, D.P. Khatua and A.K. Pal of IJIRA described a prototype model of roller drafting at drawing frame designed and developed at IJIRA. This unit consists of two pairs of drafting rollers and in between these rollers

there are four pairs of slip rollers for controlling the floating fibres in the drafting field during the drafting process. The machine is also provided with a pair of delivery rollers and a crimping box. This system of drafting can replace the conventional drafting zone of a finisher drawing frame. It has been possible to achieve a delivery speed of a little more than four times compared to Screw Gill drawframe. It is also expected that the maintenance cost will be much less because of its simplicity in design compared to high stores consumption in a Screw Gill drawframe. Jute and mesta of different qualities were drafted through the new drafting system, and sliver quality and fibre fineness were found almost identical in both the Roller drafted and Screw Gill drafted slivers. A patent has been applied for this drawing frame.

The paper by R.J. Phatak and V.A. Wakankar of Star Textile Engineering Works Ltd, Bombay, analyzed the limitations of a few mechanical designs such as flyers and spindles of the present jute spinning machine elements. Such studies may, in future, open up avenues to design indigenously new machines which can run at higher speeds and efficiency. The theoretical power requirements of different elements of the jute spinning frame, which might lead to the application of antifriction bearings at some places hitherto overlooked, were also given.

The paper by U. Mukhopadhyay and R.K. Mukherjee (IJIRA) reported the experience gathered during the last year in introducing to the jute industry the new method of instrumental feeding of the breaker card with the help of the IJIRA sliver grist monitors, replacing the conventional dollop method of feeding. It also discussed the various practical problems of operation and maintenance faced by the mills. The reasons why some mills have found it difficult to run even one or two units successfully while some others have almost completely changed over to this new system without much technical difficulty were ex-

plained. Regarding the performance of the new system in reducing the long-term (medium-term) regularity of sliver grist as compared to the dollop method, some data collected by different mills were presented in the paper. The new system was found to give a significant improvement in the sliver regularity.

The results of the studies conducted at IJIRA for developing heavy-duty bags from the finer quality fabrics were presented in a paper by B.L. Banerjee, S.K. Chakrabarti and P.K. Chatterjee (IJIRA). The paper concludes that a two-layer bag made from a standard hessian (229 g/m^2 , 38 ends/dm, 35 picks/dm, 115 cm width) shows promise as a substitute for the B-Twill bag both from the point of view of cost and performance.

It is the normal practice in the industry to soften the long jute with roots. A portion of softened root ends unsuitable for use in the same batch is discarded prior to carding. An alternative system of discarding roots prior to softening is also the practice at a few mills. The relative merits of the two systems were investigated on W_4 variety of jute by a study group consisting of 12 members from a number of mills. The group observed that yarn properties and spinning performance improved significantly but the yield of cuttings for dry-cut system was nearly twice that in the wet-cut system.

The IJIRA bran culture has long been used in the industry as an efficient softening agent for not only reducing the amount of root cuttings from long jute but also for higher utilization of softened cuttings in hessian and sacking batches with marked economic benefit. This reduction in root length of long jute by bran culture process has now been replaced by IJIRA's new approach of softening dry cuttings generated from white jute for their total utilization in the same batch because of certain processing and economic advantages. According to the paper by B.C. Chatterji, M.C. Majumdar and B.K. Chatterjee (IJIRA), the trials conducted in four

mills revealed that dry cuttings generated from white jute could be fully utilized in hessian batches, warp and weft, without any detrimental effect on productivity or yarn quality when compared with normal mill yarns. In other words, the entire length of white jute reeds could be utilized instead of diverting the cuttings to lower batches as was normally done in mills. A net saving of over Rs 55 per tonne of hessian weft batch was calculated and it was expected that saving would be still higher in hessian warp batch.

B.L. Ghosh and A.K. Dutta (IJIRA), in their paper, described a new enzymic method developed at IJIRA for softening and upgrading low-quality fibres. The method increases the proportion of such fibres in higher quality batches with satisfactory results and appreciable economy in batch cost. The proportion of different grades of enzyme-treated mesta has been increased twice or more in batches ranging from sacking warp to Russian-quality hessian. Besides mesta, other lower-grade fibres have also been found to be amenable to softening and cleaning by this enzyme process. Thus, the proportion of treated jungle tossa can be raised up to 54% in place of TD_3 and W_4 in the sacking warp batch, and the proportion of upgraded TD_4 up to 30% in place of TD_2 and TD_3 in the Russian-quality hessian batches. The process will result in a net cost saving of about Rs 50/tonne of batch.

The scope of humectant application for retention of moisture in the in-process and finished materials during the months of the year when the atmospheric humidity is normally low were studied by S. Nag, P.K. Pal and S. Ghosh (IJIRA) by carrying out bulk-scale trials in a number of mills. The results show that there is a good scope for using magnesium chloride in quantities recommended both for the hessian and carpet backing qualities during the dry periods of the year. An estimated benefit of about Rs 40 tonne of product could be expected by way of increased

spinning and weaving production by adopting the process. The moisture retention in yarns and fabrics could be increased by 1.5 - 2.0% for an add-on of anhydrous magnesium chloride by 1%, the price of which was of the same order as of raw jute.

NAL Develops Filament Winding Machine

As building materials for complex components like pressure vessels the fibre-reinforced plastics (FRP) have the advantages of good strength-to-weight ratio and ease of construction. Modern missile class launch vehicle pressure vessels are usually fabricated with FRP using filament winding techniques, wherein structural strength is achieved by a judicious mixing of hoop winding, helical and polar wound filaments.

At the instance of the Aeronautics Research & Development Board, the National Aeronautical Laboratory (NAL), Bangalore, took up the design

development of a vertical filament winding machine in 1972. The laboratory has recently fabricated a sophisticated machine capable of precisely controlled polar, hoop and helical winding, using modern closed loop electrohydraulic control and digital programming. The control system has been designed utilizing position control rather than velocity control to achieve progressive or retrogressively lapped winding configuration with controlled underlap, overlap or butt. The two winding actuators, viz. mandrel and arm, are driven by servo-controlled hydraulic motors and function on position loop with synchro position and tacho feedback, and are controlled by synchro set points which allow infinite position command. The carriage works on a similar principle but with a potentiometric feedback.

The set points are programmed using a control digital clock and a ratio divider which in turn drive a 6000-step stepper motor coupled to the set points.

The electronic ratio divider allows precise ratio control of velocities. Non-linear function programming is achieved through data-trak programmes. This concept of a central programmer actuating the position loops allows precise control. The extension of the control by a microprocessor based programmer is also rendered possible.

The hydraulic system driving the filament winding machine is a high-performance system of 160 litres/min 120 kg/cm² pressure filtered to 40 μ .

The mechanical design of the system is based on elastic deformation control under high speeds of operation with emphasis on least backlash. A specially designed 1:8 gear box allows mandrel speed control range of 1/100 rpm to 10 rpm. The arm speed control range is from 1/10 rpm to 10 rpm and the carriage travel speed for full stroke ranges from 1 hr to 4 min.

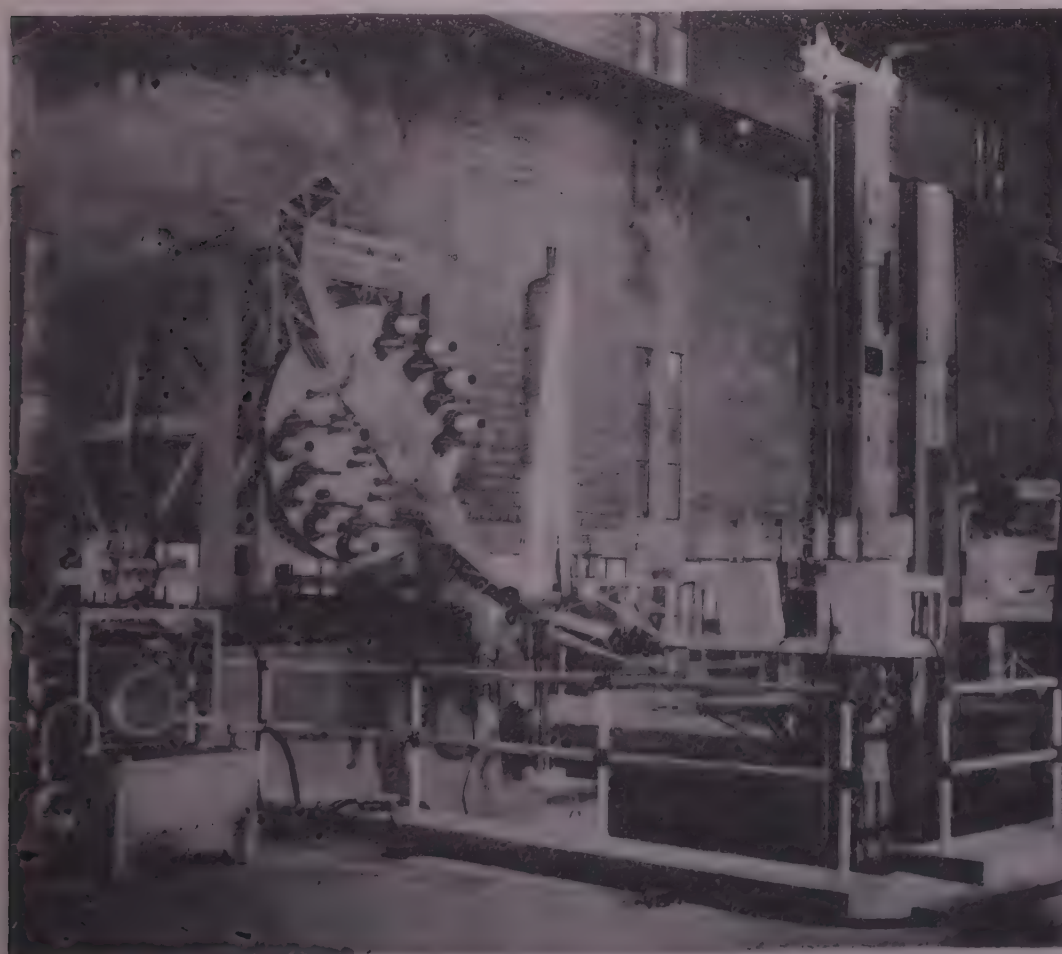
The filament winding machine possesses the following extensive support systems designed and developed by the laboratory: (1) a facility for producing pre-impregnating plant which produces a ready-to-wind pre-impregnated fibreglass rovings; (2) a facility to make a water-soluble mandrel of any shape; and (3) large baking oven for final curing of filament-wound vessels.

Considerable developmental effort has resulted in a facility capable of pre-impregnating the resin to the required degree of tackiness and cured to the required intermediate stage of polymerization.

The vertical filament winding machine commissioned in the laboratory is capable of winding FRP vessels with sizes of up to 4 m height and 0.5 - 1.5 m diameter. At present, this facility is being used to fabricate a number of pressure vessels to assess their performance.

Offshore Oil & Gas Pipelines Based on NIO's Survey

The National Institute of Oceanography (NIO), Goa, following its survey



Vertical filament winding machine : NAL

of the area from Bombay High and Bassein oilfields to Bombay for the Oil & Natural Gas Commission (ONGC) to lay a submarine oil and gas pipeline, has finally marked a pipeline route for ONGC. A pipeline is being laid along the 160 km route by the foreign consultants of ONGC.

NIO used the research vessel *Gaveshani* for survey in deeper areas, and smaller boats in shallow areas. The surveys included studies on waves, currents, temperature and the chemistry of water. Seasonal variations in temperature are particularly important for the transportation of crude through the pipeline; because, if temperature goes below a certain limit, the wax present in the crude condenses and chokes the pipeline. The data collected by NIO were extensively utilized in designing the pipeline.

The sea-bed surveys involved echosounding, side-scan sonar, shallow seismics and magnetics followed by bottom-sampling using grabs and cores. For achieving high accuracy, the surveys were carried out using accurate position-fixing systems Shoran and Mini Ranger. Four alternative routes were surveyed between Bombay and Bassein and 11 alternative routes between Bassein and Bombay High. In the Bombay Harbour area, 24 different routes were surveyed. Based on these surveys very accurate surficial geological maps showing the distribution of rock and thickness of sediments were prepared. The final route was determined from such a map, avoiding expensive trenching and blasting of rocks.

Grabs and cores from the sea-bed were analyzed to determine the engineering properties of various soils and the effect of bacteria and benthic fouling and boring organisms on the pipeline. All possible stresses which were likely to occur on the pipeline were also determined. The identification of sulphide-producing bacteria in the clays indicated the need for special protection

to the pipes. The surveys involved about 2500 line-km of echosounding, 2200 line-km of side-scan sonar and 1500 line-km of shallow seismics.

Solid Wastes Disposal Unit at NEERI

A solid wastes disposal unit has been commissioned at the National Environmental Engineering Research Institute (NEERI), Nagpur. This is a retort-type incinerator and will be used for the disposal of solid wastes generated at the institute. The Solid Wastes Division of NEERI will conduct studies on its performance with regard to velocity and temperature distribution in various chambers, removal of particulate matter, volume and weight reduction and other related aspects.

NEERI Completes Survey of Treatment Unit at Rourkela

NEERI, Nagpur, has completed an extensive survey to assess the performance of the oxidation lagoon at Rourkela Steel Plant (RSP). The physicochemical and biological survey of the oxidation lagoon was carried out, and a report, containing the results of the study and

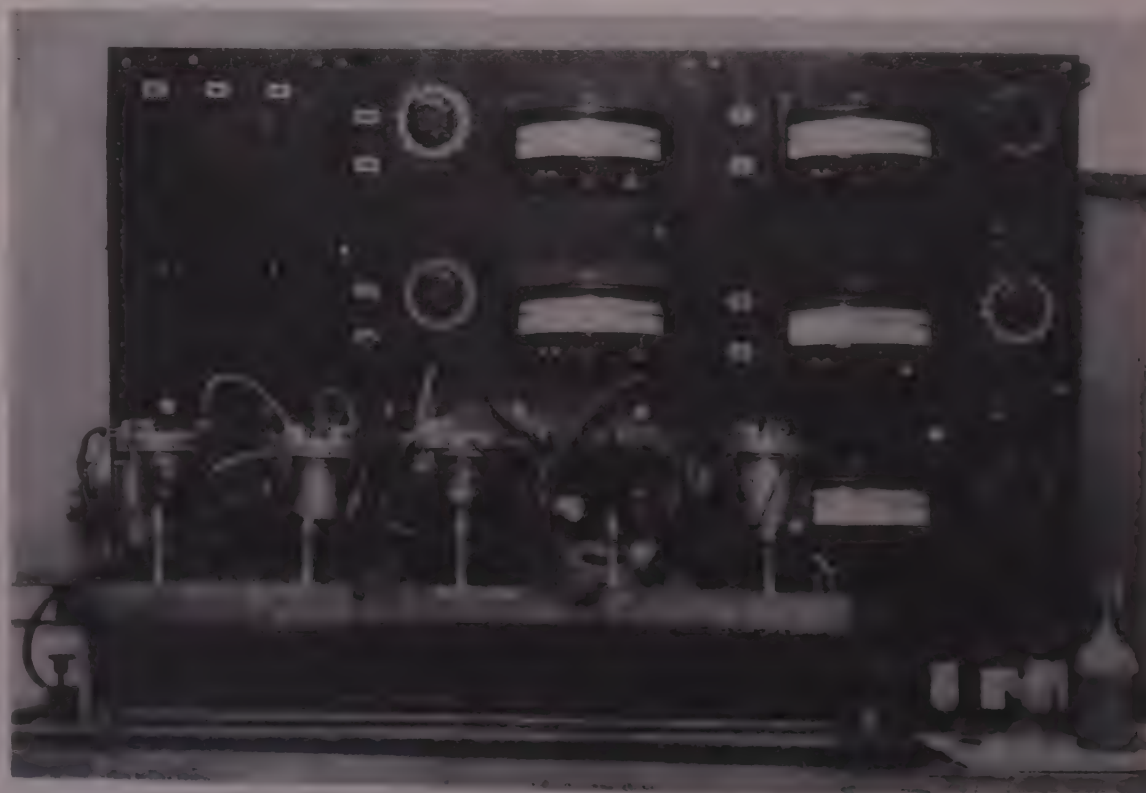
the recommendations to enable the lagoon to function as a stabilization lagoon, was submitted to RSP. All the waste waters from the steel plant enter the lagoon, and after purification to a certain extent the effluent is discharged into Brahmani River.

This study was undertaken after implementation by RSP of some of the major recommendations made by NEERI to reduce the pollution load reaching the lagoon.

IIP Develops Oxidation Stability Test Bench

The Indian Institute of Petroleum (IIP), Dehra Dun, has developed and standardized a bench-scale method for the evaluation of anti-oxidant qualities of crankcase lubricating oils. The method is inexpensive, requires a small quantity of test sample, and takes only 6 hr as compared to expensive and long-duration engine test methods. The method can also be used for the formulations of new engine oils and in the development of new anti-oxidants.

At the request of the Indian Oil Corporation Ltd, one such unit has been fabricated and supplied to them.



Oxidation stability test bench : IIP

Technique for Evaluation of Moisture Corrosion of Hypoid Gear Oils

At the request of the Ministry of Defence, the Indian Institute of Petroleum, Dehra Dun, has developed and standardized a test technique for the evaluation of moisture corrosion tendencies of hypoid gear oils. The method is based largely on CRC-L-33-959 method but utilizes only indigenous equipment and materials including the test specimen, which is taken from the rear axle of Willy's Jeep. The results obtained by this method have shown a very good correlation with those of the CRC-L-33 method.

l-Menthhol from Δ^3 -Carene

A novel process for preparing pure, crystalline *l*-menthol from Δ^3 -carene has been developed at the National Chemical Laboratory (NCL), Poona, under a project sponsored by Bhavana Chemicals Ltd, Bombay. Δ^3 -Carene is a constituent of the inexpensive and readily available turpentine oil in the country. The process has been standardized on a laboratory scale and scaling up work will be carried out by the sponsor at their site.

l-Menthhol is widely used in pharmaceuticals, cosmetics and perfumery industries.

A patent application (48 Del 77) covering the novel features of the process has been filed.

Ecological Studies on Zooplankton of Cochin Backwaters

Zooplankton consists of larval stages of fishes, prawns and other commercially important crustaceans and molluscs. It is essential to understand their life-cycles and breeding grounds since they form an important link, at the secondary level, in the food chain and energy transfer of any aquatic environment and also a primary source of food for many commercial fishes. With a view to understanding the distribution and as-

sessing the productivity of the estuary, ecological studies on zooplankton of Cochin backwaters of Kerala (area, 250 km²) were carried out by Shri M. Madhupratap, who worked under the guidance of Dr T.S.S. Rao at the Cochin regional centre of the National Institute of Oceanography, Goa.

The environment in the estuary becomes more or less a freshwater one (salinity 0-5‰) during monsoon period (May-October). Zooplankton population becomes sparse in this season and consists of 5 or 6 low saline species. Low species diversity and low zooplankton biomass (av., 0.09 ml/m³) were registered during this period.

Salinity incursion into the estuary starts during the post-monsoon months (November-December) and along with it succession of various species, both in space and time, begins. Relatively stable conditions prevail during pre-monsoon months (January-April), and zooplankton population reaches peak diversity during this period. Both zooplankton biomass (av., 0.56 ml/m³) and total counts were significantly higher during pre-monsoon.

Copepods contributed to the bulk of the zooplankton counts (70%) followed by larvae of decapods (20%). Seventy-six species, including 49 copepods, were identified. Among the copepods family, Acartiidae comprising 10 species formed the majority in the counts. A new genus and species *Archidiaptomus aroorus* (family Pseudodiaptomidae, copepoda) was recorded.

Biomass of zooplankton (dry weight) of the estuary ranged between 0.7 and 384 mg/m³. The average zooplankton production in the estuary was estimated as 31.8 mg/m³/day with a P/B ratio of about 30/yr. Production during the low saline period was only 8 mg/m³/day as against 60 mg/m³/day during the saline period. Transfer coefficient from primary to secondary level was only 2.7% and that from secondary to tertiary ranged from 3.7 to 7.0%. This showed availability of considerable amount of production and ample scope for the

expansion of culture fisheries in the estuary.

Experimental studies indicated that true estuarine high saline species may have quiescent stages to tide over the unfavourable low saline period. Tidal variations were not significant except in the population of a few species. Although some individuals are carried away with tidal motions, other individuals of the population of the species, which extends over a large area, may replace them so that the numerical abundance would remain roughly the same at a particular station. Significant diel variations were common in shallow areas with higher abundance during night. A vertical migration behaviour showing higher abundance at surface during night was observed for most species.

The pattern of succession of species showed three seral stages consisting of high saline, low saline and medium saline species. The zooplankton of Cochin backwater system could be recognized as a physically controlled community. Factor analysis considering the environmental parameters and zooplankton abundance showed salinity to be the chief factor controlling the abundance. Considering the importance of the effects of the monsoon in the system, Cochin backwaters could be described as a 'tropical monsoonal bar built estuary'.

Shri Madhupratap was awarded a Ph.D. degree (1977) by the University of Cochin for his thesis based on the studies.

Training Courses at SERC

Experimental Stress Analysis : Techniques and Applications

The Structural Engineering Research Centre (SERC), Madras, organized a training course on 'Experimental Stress Analysis : Techniques and Applications' from 2 to 12 January 1978. Participants were drawn from industry, research and academic institutions, and government undertakings. The faculty of the course

included scientists of SERC and Prof. C.A. Sciammarella, Director, Experimental Stress Analysis Laboratory, Illinois Institute of Technology, Chicago, USA, and U.N. consultant at SERC. Besides lectures, the course included design of experiments, laboratory work, and evaluation of experimental results. The major areas covered were: theory of modelling and choice of model materials; static strain measuring techniques; two- and three-dimensional photoelasticity; Moire techniques and optical processing; laser holography and holographic interferometry; and data reduction techniques.

At a one-day 'open house' organized on this occasion, Prof. Sciammarella delivered a special lecture on important industrial problems solved in USA by using experimental techniques.

A limited number of copies of the lectures delivered at the course are available with the Information Officer, Structural Engineering Research Centre, CSIR Campus, Madras 600 020, on payment of Rs 50 per set.

Modern Methods of Design and Construction

SERC, Madras, also organized a course on 'Modern Methods of Design and Construction' from 6 to 16 February 1978. The course, organized specially for the engineers of the Tamil Nadu Public Works Department, covered the following topics: design of floors and roofs for residential and institutional buildings; industrial buildings in concrete and steel; precast concrete wall panels; water retaining structures; special considerations in the design of structures; dynamically loaded structures; new constructional materials; mix design and quality control; industrialization of construction; repairs and renovations to buildings; and construction management.

Special lectures by experts and demonstration of new techniques and testing of specimens were also arranged.

Deputation Briefs

Dr R.K. Chatterjee of the Division of Parasitology at the Central Drug Research Institute, Lucknow, visited the Federal Republic of Germany under the CSIR-DAAD exchange programme. During his stay (15 Oct. 1977 to 15 Jan. 1978) in FRG, Dr Chatterjee visited several laboratories engaged in research on parasitic infections. At the Institute for Parasitology, Giessen, he had discussions with Prof. G. Lammler, Director, on the use of experimental models in the study of chemotherapy and chemoprophylaxis of filariasis. He also carried out a joint study with Prof. Lammler and Dr H. Zahner on the effect of filariasis infection on cell-mediated immunity response.

Dr Chatterjee visited Bernhardt-Nocht Institute for Tropical diseases at Hamburg and discussed with Prof. Mannweiler the limitations of excessive fractionation of antigen and studied the modified Elisa-Stick method being used there for the diagnosis of helminthic infections. At the Institute for Tropenhygiene of the University of Heidelberg, Dr Chatterjee studied the indirect fluorescent antibody test for the diagnosis of filariasis, hydatidosis, toxoplasmosis and other parasitic infections.

Social Systems Planning : Lectures by Prof. Churchman

Prof. C. West Churchman of the Department of Business Administration, University of California at Berkeley, USA, who visited the Planning Division (CSIR) during 12-23 March 1978 under the CSIR-National Science Foundation exchange programme, delivered a series of four lectures on 'Social systems planning' at CSIR Headquarters, New Delhi, during 20-23 March 1978.

In his lectures, Prof. Churchman dealt with the philosophy of planning the social systems by using the unfolding approach of analysis. According to him, it is possible to improve the society by systems thinking. The foremost ques-

tion, as a prelude to the social systems planning, is to know what are the goals that are desired to be pursued. The four unfoldings of the systems concept are its traditions, its logic, its ethics, and its enemies.

The logic of the social systems planning can be understood through a consideration of the manner in which the different types of planning approaches are pursued in a society. There may be three types of planners. First is the goal planner, who works in the framework of operations research following a series of steps, viz. formulation of the problem, modelling, optimization, role recommendation, and scheduling. The goal planner is committed to the feasible approach in relation to the problem situation. The second is the objective planner, who works in a broader framework and formulates the problems wherein a planning goal is interacting with many other goals. The third type of planner is the ideal planner -- one who always takes risks and handles unfeasible problems. Prof. Churchman's main contention is that in any system there are beneficiaries as well as victims.

Designing of social systems needs further understanding of the following aspects : purpose of the systems -- their beneficiaries and victims, measurement of performance, decision-making, multiplicity of objectives, change agents, boundaries of the systems, selection of the planner, implementation, and the guarantor of the systems. The importance and implications of each one of these aspects were discussed in detail.

Today's problems of the world are created by militarization, malnutrition, and inequality among people. The enemies of the social systems are politics, religion, aesthetics and morality. Out of the human needs, individuals form political unity around specific issues and fight the systems. Religion needs sacrifice and adoration. In Prof. Churchman's opinion, today, economy is the religion, the economist is the priest, and economic institutes and

agencies are the temples. Social systems are complex phenomena and their planning must benefit from the historical experiences for creating the right systems.

PROGRESS REPORTS

NBG Annual Report: 1976

The National Botanic Gardens (NBG), Lucknow, has brought out its annual report for 1976. The 88-page report shows that during the year, 41 research projects were investigated. Of these, 37 research projects were of applied nature and 4 of fundamental nature. Thirty-five projects were in-house research programmes, and six were sponsored ones. The sponsored projects included one each sponsored by the United States Department of Agriculture under the PL-480 research programme, the Central Council for Research in Indian Medicine and Homoeopathy, and the U.P. Council of Scientific & Industrial Research. Three projects were investigated under the auspices of the coordination council for the biological sciences group of CSIR laboratories.

Efforts were continued to widen the scientific base of the floriculture industry so as to enrich the nursery trade with new and novel cultivars. Complete technology was worked out for raising the F_1 hybrid seed of marigold, developed by crossing the male sterile African marigold with the male fertile French marigold. Five new cultivars of ornamental foliage amaranths, belonging to the *Amaranthus tricolor* Linn. complex, were developed, and the cytogenetics of the complex was studied. Six new cultivars of *Chrysanthemum* were developed from 'Nanako', a Japanese cultivar bearing yellow Pompon flowers, by hybridization and three cultivars of another Japanese *Chrysanthemum* cultivar, 'Otome-Zakura', by irradiation. A new cultivar each was produced of *Nyctanthes arbortristis* Linn., the well-known 'Parijat' shrub and *Erythrina* spp.

'Wajid Ali Shah', a new hybrid cultivar between *Bougainvillea* cvs. 'Dr

B.P. Pal' and 'Mrs Chico', and 'Archana', a bud sport from *Bougainvillea* 'Roseville's Delight', were also established.

The etiology, mode of spread and control of virus diseases of two ornamentals *Dorotheanthus bellidiformis* (Burm. f.) N.E. Br. and *Vaccaria pyramidata* Medic. were studied. Panacide, an algicide, at 20 ppm level was found to be suitable for inhibiting the growth of *Scenedesmus obliquus* (Turp.) Kuetz., a noxious alga of lily ponds and garden tanks.

Winged bean (*Psophocarpus tetragonolobus* A.Dc.), an under-exploited tropical plant rich in protein, has been successfully introduced to Lucknow and so has been a higher-yielding strain of *Matricaria chamomilla* Linn., which gives blue oil of commerce.

Efforts aimed at propagation of ornamental and economic plants, and supply of educational plant materials and authentic nursery stock, at nominal rates, to nurseries and others were considerably stepped up; proceeds amounted to Rs 1.016 lakh for the year.

An exhibition of indigenous herbal drugs was organized, in collaboration with eight other organizations, to highlight the role and scope of the indigenous systems of medicine in ameliorating human suffering and to spotlight India's rich medicinal flora.

At the request of the Government of Arunachal Pradesh, NBG participated in a joint botanical expedition to Tawang, together with the Regional Research Laboratories at Jorhat and Jammu and the Botanical Survey of India, Eastern Circle, during August-September 1976.

Seventy-six research papers were published during the year.

PATENTS FILED

62/Del/78 : 17a-(2-Acetoxyethyl)-3 β -pyrrolidino-17-a-aza-D-homoandrost-5-ene-dimethiodide (HS-627) and other N-(2-acetoxyethyl)-nucleoazasteroids, Harkishan Singh, T.R. Bhardwaj & D.

Paul (CSIR Scheme) - Department of Pharmaceutical Sciences, Panjab University, Chandigarh.

165/Del/78 : A novel design of combustion tube for rapid and simultaneous determination of carbon, hydrogen and chlorine or bromine or iodine or sulphur in organic matter, coke and coal, steel samples, etc., R.B. Malvankar, S.S. Ramdasi & V.S. Pansare-NCL, Poona.

PERSONNEL NEWS

Appointments/Promotions

Dr A.K. Banerjee

Dr Ashim Kumar Banerjee of the Central Fuel Research Institute (CFRI), Dhanbad, has been appointed, on promotion, Scientist EI with effect from 4 November 1977.

Born in April 1933, Dr Banerjee obtained his M.Sc.(Tech.) in applied chemistry from the University of Calcutta in 1957, joined CFRI as a Senior Scientific Assistant in 1958, and was promoted to Scientist B in 1965 and to Scientist C in 1970.

Since 1961 Dr Banerjee has been studying the structural pattern of coal, and his studies have revealed the existence of a polymeric set-up in coal structure. Based on his work in this area, Banerjee was awarded a Ph.D.(Sc.) degree from the University of Calcutta in 1976.

In recent years, Dr Banerjee has been engaged in the development of a nitrogenous organic fertilizer from oxidation products of coal, e.g. the water-soluble aromatic polycarboxylic acids. His studies on the characterization of oxidation products of coal have led to the understanding of the origin of fusain in coal and mechanism of aerial oxidation vis-a-vis the alkali solubility of coal.

Dr Banerjee's researches have spanned over: (i) physico-chemical aspects of fine coal washing by froth flotation technique; (ii) preparation of a suitable binder from low-temperature coal carbonization tar for production of formed coke; and (iii) esterification of coal acids and development of water-repellent

compounds from them. He is also responsible for the development of a method for the estimation of the methyl group attached to an aromatic carbon in any polymeric set-up. Presently, Dr Banerjee is guiding research on low-temperature oxidation and spontaneous ignition of coal from the standpoint of structural chemistry.

Dr Banerjee has to his credit more than a dozen research papers and a patent on the synthesis of a herbicide.

* * * *

The following personnel have been appointed, on promotion, at the Publications & Information Directorate (PID), New Delhi: Shri S. Nagarajan (Scientist E; 1 April 1978), Shri S.S. Saxena (Scientist E; 28 April 1978), Mrs K. Ramachandran (Scientist E; 29 April 1978), Miss L.V. Asolkar (Scientist C; 3 April 1978), and Shri Ramesh Chand (Scientist B; 21 Feb. 1978).

* * * *

Shri N.K. Suneja has been appointed Technical Officer (Printing) at PID (29 Nov. 1977).

Current Awareness Titles in Fuel Science and Technology

The Central Fuel Research Institute (CFRI), Dhanbad, has started bringing out from this year a new monthly awareness service under the above title. The titles listed relate to developments in hydrocarbon research, with emphasis on fuel and energy aspects. Enquiries regarding the publication (mimeographed) may be directed to Shri R.S. Saha, Officer in Charge, Library and Documentation Section, Central Fuel Research Institute, Dhanbad-828108.

Photocomposition-cum-Printing Facility at PID

To cope with its increasing publication activity the Publications & Information Directorate (PID), New Delhi, has recently acquired and commissioned a photocomposing equipment at its premises. A second-generation equipment, it consists essentially of two main units:

the keyboards and the filmsetter. Of the five keyboards acquired, four are identical and are meant for punching /composing straight copy and the fifth one, known as Large Display (LD) keyboard, is used for handling mathematical copy.

The principle of the photocomposition process is the conversion of the copy by the keyboard operator into a series of machine-readable perforated codes in an 8-channel ISO-coded paper tape. These perforations, which act as signals to the filmsetter, produce characters and spaces and perform such functions as line measures, point size, double exposure, and several others. A set of photographic negatives (characters in a matrix case) is positioned sequentially in accordance with the instructions in the tape so as to produce, on film or paper, a photographic reproduction of the characters representing the type of the size desired within the range 5-24 pt or Didot (16 sizes being available). Some of the special features of the filmsetter are that it is possible to mix founts readily without con-

sideration for set size, and that it has a width-counting increment of 1/96 of a square quad, a measure range of 0-54 pica ems (up to 228 mm), and an output speed in excess of 40,000 characters per hour. A tape-merging facility for correcting typographical and other errors is also provided. The light source for the filmsetter is a 12V 55W tungsten /halogen lamp. It is proposed to acquire an editing panel as also an automatic film processing unit.

The output from the filmsetter is converted into hard copy by the conventional photo-offset process for which PID has acquired two printing machines.

Also attached to the PID's printing unit are a semi-automatic folding machine, a station-gathering machine, a 3-side trimmer, a binding machine, etc.

This issue of CSIR NEWS has been composed and printed at the PID Photocomposition-cum-Printing Unit. In course of time, all periodicals and other publications being issued by PID will be brought out using its in-house composing and printing facilities.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 7/78

It is proposed to appoint a Scientist F (Deputy Director) for Central Salt & Marine Chemicals Research Institute, Bhavnagar.

Job Requirements: The candidate is expected to organize, guide and conduct process and engineering research and development activity in the area of desalination, specifically in reverse osmosis and electrodialysis where development of configurations of the type spiral, hollow fine fibre, etc. is involved. He should be able to carry out system analysis and engineering design of new concepts in these areas. The candidate should be dynamic enough to undertake the extension work and dissemination of the research results for rural and industrial development. He should be familiar with manufacture techniques for mass production. The incumbent is also expected to assist the Director in formulating the programmes specially extension work pertaining to desalination installations.

Qualifications and Experience (Essential): High academic qualifications in mechanical engineering/chemical engineering with minimum ten years' research & development experience in the field of design, fabrication and erection of plants with proven ability.

Salary, Conditions of Service: The salary scale attached to the post is Rs 2000-125 2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years (including the period of probation) after successful completion of probation period of two years. Other conditions of contract will be supplied on request.

Age limit: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain six copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma should be received in this office on or before 15 June 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

10509124

20 JUN 1978

Transfer of National Laboratories

Four laboratories, three museums and 10 cooperative industrial research associations have been transferred from the Council of Scientific & Industrial Research (CSIR) to concerned user ministries/departments with effect from 1 April 1978. The list of laboratories, museums and cooperative research associations as also the ministries/departments to which they have been attached has been published in CSIR NEWS, 28 (1978), 1.

Under the new arrangement, CSIR will act in an advisory and consultative capacity to the societies of these laboratories.

The transfer is for the present designed to be an experiment which will be reviewed later in order to determine its effectiveness.

Symposium on Industrial Fermentation

An all-India symposium on Industrial Fermentation was organized by the Regional Research Laboratory (RRL), Jammu, from 4 to 6 March 1978 at Jammu. Inaugurating the symposium the Chief Minister of Jammu & Kashmir, Shri Sheikh Mohd Abdullah, complimented the RRL scientists on developing a complete process for manufacturing citric acid for the first time in the country, thus breaking the monopoly held for decades by multinationals. Emphasizing the need for a well-developed indigenous fermentation technology, Dr L.K. Behl, Chairman & Managing Director of Indian Drugs &

Pharmaceuticals Ltd., in his keynote address, stated that the Indian industry had to re-import high-yielding microbial strains even for those antibiotics which were in production for more than a decade or two. He suggested that all the industrial laboratories dealing with strain development should augment their facilities, as also manpower, for accelerating the work. The chairman of the inaugural session, Prof. J.V. Bhat, Director of Research, K.M. College, Manipal, stressed the need for establishing a National Collection of Type Cultures in the country and also the development in academic research laboratories, if not in the industries themselves, of suitable cultures for progress in the existing fermentation industries and for widening their scope. The symposium was attended by 120 delegates from research institutes, IITs, universities and industries. Prof. C.T. Calam of the Liverpool Polytechnic, U K; Dr E.G. Jefferys of ICI, U K; and Prof. L.B. Lockwood of Western Kentucky University, U S A, were the chief overseas participants. The deliberations were divided into nine technical sessions: Organic acids; Wines, ciders and fermented beverages; Pharmaceutical products I (antibiotics, steroids and others); Pharmaceutical products II (ergot alkaloids and phytochemicals by plant cell culture); Amino acids, vitamins and growth factors; Enzymes; Biomass, proteins and utilization of wastes; Microbial leaching of minerals; and Biochemical engineering.

Prof. Lockwood and Prof. Calam described the importance of the handling of the cultures in all the industrial

fermentation processes. Dr Jefferys presented a paper on gibberellic acid fermentation at ICI. The RRL—Jammu group presented their work on citric acid, while the RRL—Bhubaneswar group presented their work on the microbial leaching of minerals and stressed that this work should be coordinated with industries. A laboratory fermenter designed by the Central Food Technological Research Institute, Mysore, was exhibited at the symposium.

The plenary session of the symposium recommended that:

- (1) A National Culture Collection should be established;
- (2) Training of fermentation technologists should be speeded up;
- (3) Interaction between universities, industries and research institutes in the fermentation R & D work should be established;
- (4) Production of amino acids and enzymes by fermentation should be enhanced;
- (5) Perishable fruits and industrial and agricultural wastes should be utilized;
- (6) Petroleum and mineral wealth should be tapped by the use of microorganisms; and
- (7) Government should be requested to abolish custom duty on biochemicals, chemicals and appliances required for research purposes.

An *ad hoc* committee, with Dr C.L. Chopra (RRL, Jammu) as convener, was set up to work out a forum for holding symposia on fermentation every two years.

Seminar on Industrial Wastes

Deep concern for the indiscriminate discharge of waste-water from the pulp and paper mills and distilleries, besides others, which cause environmental damage, and in particular, water pollution problems, was expressed by the participants at a seminar on 'Industrial Wastes' held at Calcutta on 8-9 December 1977. The seminar, organized by the National Environmental Engineering Research Institute, Nagpur, and the Calcutta Metropolitan Development Authority, recommended that the industries be asked to take a deep look into these pollution aspects and to implement control measures in a rational and scientific way. The seminar also emphasized the role of the Water Pollution Control Boards of various states in bringing about the necessary contacts and interactions with industries for making waste-treatment practice an accepted norm for new industries. For the existing industries also, it was recommended that a programme of treatment should be implemented in consultation with the state boards.

The seminar further urged the state governments to make the pollution control boards an effective tool for prevention and control of pollution technically, managerially and financially. It recommended that the R & D activities should be geared up under the guidance and control of proper agencies so that more realistic and economical treatment methods could be worked out for the benefit of industries as well as municipalities. The seminar observed that various solid wastes produced by pulp and paper mills could be controlled by recovery and salvage methods. The effluents, excepting for colour, lignin and lignin compounds, could be adequately treated. Further research should be continued to achieve better control of colour and oxygen-consuming compounds. The seminar noted that combined treatment, whenever feasible, of industrial wastes and municipal sewage be convenient and economical.

The seminar was found useful for interaction and exchange of ideas amongst scientists, technologists, and engineers of R & D institutes, implementing agencies, and industries concerned. It was finally recommended that in order to take stock of the situation and suggest appropriate measures to combat the problems, such seminars should be held at least every alternate year.

CSMCRI's Expertise for Salt Works in Jeddah

The Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar, has recently completed a project on turn-key basis at Jeddah, Saudi Arabia, for producing 20,000 tonnes of salt per annum. The institute undertook the entire design and layout of the solar salt works spreading over 100 ha of land. The main features of the project were the selection of a suitable site, determination of soil conditions and optimum production rate of common salt under prevailing climatic conditions, and harvesting of salt by the most modern mechanized system, etc. This solar salt works is the first of its kind in Saudi Arabia. India earned about Rs 1 lakh in foreign exchange through this consultancy.

Shri G.B. Rathod of CSMCRI, who has developed several solar salt works in India and Sierra Leone (West Africa), carried out the consultancy assignment on deputation.

Synthesis of Rubber Accelerators

The sulphenamide accelerators are mainly used for the vulcanization of styrene-butadiene rubber (SBR) which vulcanizes slowly. Shri D.R. Patil, a CSIR research fellow who worked under the guidance of Dr N.D. Ghatge at the National Chemical Laboratory, Poona, synthesized three sulphenamides, viz. N-cyclohexyl-N-phenyl-, N-methyl-N-phenyl-, and N,N-diphenyl-2-benzo[1,2-*d*]thiazole sulphenamides, and evaluated them as secondary accelerators in combination with TMT, Ethasan, etc. with various fillers like carbon black, whiting, hy-

drated silica and hard clay in SBR. The physical and rheometric properties of the vulcanizates were studied and compared with those of vulcanizates prepared by using commercial mercapto-benzothiazole disulphide and N-*tert*-butyl-2-benzothiazole sulphenamide.

CNSL in Resin-making

The distillation of cashewnut shell liquid (CNSL) under reduced pressure gives 3-pentadecenylphenol, commercially known as cardanol. Shri Patil used cardanol as the starting material for preparing (i) 3-pentadecenylphenoxy-acetic acid, its dimer, polyamide, and copolymers with oleic, linoleic and ricinoleic acids; and (ii) epoxy novolac resins. The epoxy novolac resins were also prepared from dimerized 3-pentadecenylphenol, and were evaluated for surface coating.

Shri Patil was awarded Ph.D. degree of the Shivaji University, Kolhapur, for his thesis based on these studies.

Deputation Briefs

Under the India-US Exchange of Scientists programme, Dr B. Banerjee of the Central Fuel Research Institute (CFRI), Dhanbad, visited various institutions in USA during November-December 1977, and familiarized himself with the latest methodology and techniques of coal exploration as applied to the survey and rational utilization of coal. He also studied varied aspects of research and development activity in coal technology. Dr Banerjee's itinerary included visits to: US Geological Survey Headquarters, Reston; US Geological Survey Central Region, Denver; US Bureau of Mines, Washington D.C. and Pittsburgh; Colorado School of Mines, Golden; Illinois State Geological Survey, Urbana; Bituminous Coal Research Inc., Monroeville; and United States Steel Corporation, Monroeville. During his visits to these establishments, Dr Banerjee acquainted himself with various techniques used for geophysical well-logging in coal prospect evaluation; detection and estimation of methane content of coal seams from exploratory cores before mining; and

degasification of methane-laden coal beds in advance of mining.

Other studies in which Dr Banerjee participated were high resolution seismic reflection technique for mapping coal seams at depths from surface; and process developments for determination of mineral matter and trace elements in coal. He attended a number of seminars on coal geology, fuel, and hydrocarbon research at various centres. He also attended the 90th annual meeting of the Geological Society of America at Seattle during 7-9 November 1977 on a special invitation by the National Science Foundation.

CSIR Museums to Celebrate Einstein Birth Centenary

The birth centenary of Albert Einstein is being celebrated by CSIR museums this year. In collaboration with the Indian Association for the Cultivation of Science, the Satyendranath Bose Institute of Physical Sciences, and the Indian Association for General Relativity and Gravitation, CSIR museums have drawn up a year-long programme, which includes, among other items, exhibitions, popular lectures, academic seminars, students' seminar, and science quiz contest relating to the life and works of Einstein.

The programme was inaugurated by Dr P.C. Chunder, Union Minister for Education and Social Welfare, and Vice President of CSIR, on 11 March 1978 at the Birla Industrial & Technological Museum, Calcutta. A seminar was organized on 14 March at which lectures were delivered on the contributions of Einstein.

PROGRESS REPORTS

CIMPO Annual Report: 1976-77

The Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has published its annual report for 1976-77. The laboratory continued to lay stress on the development of superior agrotechnology for cultivation of medicinal and aromatic plants and their processing. The CIMPO regional centres at

Haldwani and Bangalore produced medicinal crops, essential oils and other plants worth Rs 2.3 lakh. Sales of essential oils and planting material amounted to Rs 3.89 lakh. The commercial unit in Jammu and Kashmir produced goods worth Rs 51.96 lakh. A 21-ha research farm has been set up at Kukrail, Lucknow, for carrying out research on various agricultural aspects of medicinal and aromatic plants. Steps were under way to set up two more new regional centres, one each at Kodaikanal and Darjeeling.

The laboratory gave high priority for development of technologies for cultivation of sapogenin-bearing plants.

A number of new species of medicinal and aromatic plants of commercial value were introduced under the agroclimatic conditions of Karnataka. Amongst the *Dioscorea* species introduced, viz. *D. composita* Hemsl., *D. deltoidea* Wall., *D. floribunda* Mart. & Gal. and *D. prazeri* Prain & Burk., *D. composita* and *D. floribunda* were promising. The average yield of tubers from one-year old plants of *D. floribunda* in Belur farm was 0.73 kg and from ten-month old plants in Coorg farm was 0.82 kg per plant.

Lemongrass was introduced at Belur farm on a small area. The crop has come up very well and trial distillations indicated an oil yield of 0.4% with 92% citral content. It is proposed to extend the cultivation of lemongrass to a larger area. Similarly, *Eucalyptus citriodora* was successfully cultivated and it was found that a yield of about 320 kg of oil per hectare could be obtained from second year onwards.

The regional centre at Haldwani carried out rotational trials in randomized block design with *Citronella* Java and *Mentha arvensis* crops under the tarai climate of Uttar Pradesh. The economics of cultivation of *Costus speciosus* under the tarai climate of Naini Tal was also studied.

Pycnanthemum flexuosum has been introduced in the tarai of Naini Tal. During the period January to August,

two harvests were obtained, yielding 115 kg of oil per hectare. The flowers and leaves contained maximum amounts of oil — 5.6% and 2.3% respectively; stems contained negligible quantities of oil, whereas the whole herb yielded 2.15% of oil (fresh weight basis). The oil contained 77.42% pulegone. Pulegone finds use in scenting of soaps, tooth-pastes and also serves as a starting material for synthetic menthol.

Ergot of rye (*Claviceps purpurea*) was introduced on a commercial scale in the tarai region of Uttar Pradesh. It was also introduced on farms of private growers with CIMPO's assistance. Detailed investigations on the diseases of *Cymbopogon*, *Mentha* and *Costus* species were taken up for the first time in northern India. Optimum requirements of major nutrients for Japanese mint were established for north Indian plains.

CIMPO developed a 1-ha hops (*Humulus lupulus*) yard at Manasbal farm; 400 kg of hops cones were produced and sold to brewery industry. An improved process for the production of xanthotoxin from *Ammi majus* seeds has been developed at the Jammu regional centre. A yield of 2.0-2.2% of xanthotoxin could be obtained by this process as compared to 0.4-0.7% by earlier methods.

Different species of *Ocimum* have been introduced at Jammu to assess the yield potential and quality of the oil. Clary sage (*Salvia sclarea*), which yields a costly essential oil and is a valuable raw material for perfumery industry, has been introduced in the Kashmir valley. The growth of the species has been found to be encouraging.

Pyrethrum oleoresin is an important insecticide as it is non-toxic to warm-blooded animals. But pyrethrins, waxy materials and pigments present along with it make the product unsuitable for sophisticated pesticide formulations and aerosol bombs. A simple method has been developed which not only makes the product pale and dewaxed but also upgrades its quality more than 2.5 times.

The dementholized oil obtained after isolating 40% of menthol in the form of crystals from *M. arvensis* oil has been further worked out for producing a further quantity of menthol. The process is based upon the sodium complex formation with menthol, and simultaneously reduces menthone and saponifies menthol. The process gives 27.5% of menthol based upon the weight of dementholized oil.

Two farm bulletins, one each on *Belladonna* and *Pyrethrum*, were brought out.

CBRI Annual Report: 1976

The Central Building Research Institute (CBRI), Roorkee, has brought out its annual report for 1976. The report (royal 8vo; pp, viii + 98) summarizes the R & D activities under the following disciplines: Building materials; Soil engineering; Efficiency of buildings; Building processes, plant and productivity; Architecture and physical planning; Fire research; and Rural buildings. The institute completed 35 projects during the year. Fourteen patents and processes were released to 22 parties for commercial exploitation. Some of these related to gypsum kettle, compaction piles, lime sludge based masonry cement, corrugated roofing sheets and high draught kiln for brick manufacture. Technical advice was rendered on the manufacture of bricks from different types of soil, stone block masonry, thin precast lintels, foundations for TV and transmission line towers, lime kilns and several other low-cost building techniques. With the commissioning of the fire research/rating furnaces, the institute can evaluate various building materials and full-size building components to solve the fire problems in buildings.

Obra and Pipri soils are unsuitable for brick-making. Bricks made from such soils cracked during drying and firing and showed lime bursting. By utilizing fly ash from Obra thermal power station and 0.5 % common salt, cracking losses during drying and firing were reduced

and good-quality bricks could be manufactured from these soils. Similar investigations carried out on usar (alkali) soils of Faridkot showed that the addition of 0.5 % barium carbonate or 0.5-0.7 % common salt along with 3-5 % coal ash helped produce good-quality bricks from such soils. Building bricks having a compressive strength of 80-100 kg/cm², and water absorption of 13-15 % and free from efflorescence could be manufactured. Bricks manufactured from such soils, without any treatment, showed heavy efflorescence and lime bursting and yielded low strengths (40-60 kg/cm²).

Laboratory investigations and factory trials have shown that zinc mine tailings could be used to produce cellular concrete similar to that made from ground sand. The compressive strength of cellular concrete blocks varied from 2.5 to 60 kg/cm², which shows that insulation and load-bearing grade blocks could be produced from this concrete. Gold and copper mines tailings have been used as fillers for production of cement tiles and in mortars and concretes.

The institute investigated the cause of foundation failure of a large ammonia tank at Cochin and restored it to its full capacity.

The institute provided to EMC Steel Ltd, Calcutta, who were constructing a 70 km, 132 kV, ac transmission line in Dubai, designs of foundations for towers subjected to loads of up to 350 tonnes in compression, 311 tonnes in uplift and 128 tonnes in side thrust per leg. The conventional open footings were not possible in view of the tight time schedule and on techno-economic grounds. As an alternative, bored underreamed pile foundations developed by CBRI were recommended.

The institute also designed economical foundations for 400 kV substations at Muradnagar and Kanpur and for TV towers at Lucknow and Kanpur.

Among the construction techniques developed by the institute, channel units and stone masonry blocks were widely

adopted since they proved economical as compared to the traditional construction practices. The former technique was adopted by Tamil Nadu Housing Board and a saving of Rs 1.06 lakh and 100 tonnes in the consumption of cement was reported. The stone block masonry for walling was adopted by Himachal Pradesh Housing Board for constructing houses for middle-income group, low-income group, and economically weaker sections at Simla, Nahan and Dharamshala. This technique was found to be 16% and 26% cheaper as compared to conventional brick nogging and dhajji work respectively. The Rajasthan Housing Board has constructed about 100 houses with this technique at Jaipur and Kota, besides 400 shops at Jaipur.

In collaboration with the Education Department, Manipur, CBRI developed plans and techniques for constructing primary school buildings. The cost of these buildings was reported to be 40% less than that of conventional constructions. With the financial assistance from World Bank, several types of health care buildings were put up in six districts of Uttar Pradesh. The designs of these buildings were developed at the institute.

A design of a semi-underground concrete bin of 1 tonne capacity was prepared and a prototype was constructed to assess the constructional feasibility, structural stability, cost and functional aspects. The estimated cost of this bin is Rs 400.

The institute brought out a handbook on Pile Foundations. Thirty-six papers were published during the year.

RRL-Bhubaneswar

Annual Report: 1977

The annual report of the Regional Research Laboratory (RRL), Bhubaneswar, for the year 1977, published recently, shows that the laboratory investigated 30 applied projects, including nine sponsored projects. Besides, a number of exploratory and basic research projects were also in progress. The principal

areas of thrust in the R & D programme of the laboratory were (i) systematic mineralogical studies on various ores and minerals, (ii) conservation and beneficiation of low and off-grade ores and minerals, (iii) development of processes for agglomeration of concentrates and extraction of metal values, (iv) utilization of vast mineral and metallurgical wastes and byproducts, (v) development of processes for inorganic and organic chemicals of industrial importance, (vi) utilization of forest and agricultural produce and byproducts, and (vii) cultivation and propagation of medicinal, aromatic and other economic plants. The laboratory has further augmented its infrastructural facilities for undertaking R & D work both in bench and pilot plant scale in the areas of mineral beneficiation; extractive metallurgy; preparation of special materials, composites, and inorganic chemicals; and development of alloys.

Studies on various samples of ores and minerals, ore sinters, inorganic chemicals, metals and special materials provided valuable information regarding the identification of ore and gangue minerals, their proportions, texture and liberation size; identification of metal phases and compounds; and trace impurities in them.

On behalf of the Rajasthan State Industrial and Mineral Development Corporation, the laboratory undertook a project on beneficiation of graphite from Rajasthan. A sponsored project on beneficiation of andalusite was also pursued.

A collaborative project was undertaken with Kalinga Iron Works, Barbil (Orissa); for setting up an iron ore sinter pilot plant (capacity, 1 tonne of sinter mix per batch) based on the results of laboratory investigations carried out earlier. The pilot plant was expected to be commissioned soon at Barbil.

The process for the preparation of electrolytic iron powder was licensed to a party through NRDC. Studies on extraction of nickel and cobalt from lateritic nickel ores on 5 kg scale were carried out. Extraction of vanadium by

salt roasting of vanadium ore was carried out successfully on 250 kg scale in a coal-fired furnace. The laboratory also developed an attractive process for the preparation of electrolytic manganese dioxide and manganese sulphate monohydrate from ferromanganese slag, sulphuric acid being the leachant.

The laboratory developed a low-cost roofing slab using cement chips and GI wires. Load testing on the slab showed that it had more strength than asbestos sheets. The cost is also much lower than that of asbestos.

The basic design of a cyclone furnace was completed and work on its development was started. An electrically heated rotary kiln was being designed and fabricated. A sponsored project on materials transportation through high-density polyethylene pipe was completed and its report was under preparation.

Consultancy services were rendered to Orissa Mining Corporation in the design of apron feeder and also to a number of industries and entrepreneurs on dehydration of castor oil, spray drier unit and cultivation of *Solanum khasianum*, palmarosa, cinnamon and *Eucalyptus citriodora*. The earnings from consultancy services, sponsored projects, testing, and analyses amounted to Rs 0.89 lakh.

Three processes/products, viz (i) beneficiation of natural graphite, (ii)

steam distillation unit for the extraction of essential oil, and (iii) ultrasonic therapy unit, were licensed to industries for commercial utilization. Five processes, viz. (i) preparation of ammonium vanadate from vanadium sludge of alumina industry, (ii) isatoic anhydride from phthalimide, (iii) methaqualone and methaqualone hydrochloride, (iv) methyl and ethyl anthranilate from isatoic anhydride, and (v) production of copper sulphate, were referred to CSIR for being assigned to the National Research Development Corporation of India (NRDC) for commercialization.

Feasibility reports on production of fish meal (1 tonne/day), isatoic anhydride from phthalimide, and methyl and ethyl anthranilates were prepared. Project reports on production of fish meal on cottage scale as an appropriate technology for rural development, scope for development of salt fields and marine chemical industries in the Orissa region, process for manufacture of slag wool, and cultivation of *S.khasianum* were also prepared.

The laboratory was awarded Independence Day certificate of merit by NRDC for developing an ultrasonic therapy unit.

During the year under review, 31 research papers were published and 14 patents filed. A symposium on 'Utilization of mineral and metallurgical wastes and byproducts' was organized.

CSIR SUPPORT TO RESEARCH

Forecasting Techniques

Carrying out her investigations in adaptive forecasting, Miss B. Chandra, who was formerly a junior research fellow under a CSIR research scheme, developed a method of adaptive response rate in exponential smoothing method as an alternative to Trigg. Leach's tracking signal. The method has been called 'dynamic regression'. She worked under the supervision of Dr A. Ghosal of CSIR Headquarters and Prof. S.M. Sinha of the University of Delhi.

Miss Chandra has also developed a series of higher-order predictors, all of which come out as special cases of Box-Jenkins ARIMA model. In the field of non-linear control model, she extended Ghosal's dynamic logistic model by considering parametric changes. She has done extensive computer applications of the models on real-life problems.

Miss Chandra, who is now a lecturer in operational research at the University of Delhi, has been awarded Ph.D. degree by this university for her thesis based on the investigations.

Hypocholesterolemic Effects of Polyunsaturated Fats

Recognition of direct relationship between atherosclerosis and blood cholesterol levels has led to extensive search for agents which can effectively lower blood cholesterol levels. The effect of different dietary fats on blood cholesterol levels assumes considerable significance, because of overwhelming evidence that the dietary fats exert profound influence on the blood cholesterol levels in various species of animals. Although it has been widely demonstrated that in humans as well as in many other animals intake of plant fats which contain very high proportions of linoleic acid lowers blood cholesterol levels, no conclusive evidence regarding the actual mechanism of such hypocholesterolemic action of polyunsaturated fats has been obtained. Four possibilities have been proposed by various workers (i) reduced absorption of cholesterol, (ii) reduced synthesis of cholesterol, (iii) increased excretion of cholesterol and its catabolites, and (iv) redistribution of cholesterol from blood to various tissues. But the evidence has never been sufficient to establish any one of them.

Since bile is the major route of excretion of cholesterol and its catabolites as well as of many toxic substances from the body, attempts were made by Shri Ranajit Pal, a CSIR junior research fellow working in the Biochemistry Department of the Indian Institute of Science, Bangalore, to correlate the hypocholesterolemic effects of polyunsaturated fats with the excretion of lipid through the bile.

The studies demonstrated that in rat, feeding of polyunsaturated fats in the form of safflower oil or soya phospholipids increased the rate of bile flow as well as the excretion of cholesterol through the bile. It was also found that the fatty acid composition of the hepatic and biliary lipids underwent marked changes in the rats fed with polyunsaturated fats, as compared to the rats fed

with saturated fats. The effect was striking in the case of the biliary phospholipids: these contained very high proportions of unsaturated fatty acids.

Pal also studied the mechanism of absorption of phospholipids and the contributions of dietary phospholipids to the synthesis of biliary lecithin. By isolating the micellar phase from the intestine of rats that were given different amounts of lecithin, Pal has demonstrated that considerable amounts of dietary lecithin appeared in the micellar phase, a part of which was probably absorbed intact.

Investigations regarding the mode of excretion of dietary labelled lecithin showed that the dietary lecithin made appreciable contributions to the synthesis of biliary lecithin and that some proportions of it were even secreted into the bile intact.

The lipid compositions of the bile of different species of animals like goat, sheep, chicken, monkey and guinea pig were also studied. It was observed that lecithin constituted the major phospholipid in all these bile samples. However, appreciable amounts of phosphatidylethanolamine were also detected in the bile of chicken. While cholesterol and free fatty acids were the major neutral lipids in the bile of all species, no cholesteryl ester was detected in any of the bile samples analyzed. The composition of the bile acids varied with the animal species. Chenodeoxycholic acid was the major bile acid in the chicken and guinea pig biles, while in the sheep and goat biles, cholic acid content was much higher than chenodeoxycholic acid. However, small amounts of lithocholic and deoxycholic acid were detected in the goat and sheep biles. Interestingly, chicken bile, which contained maximum amounts of cholesterol, had appreciable amounts of unsaturated lecithin, in contrast to sheep and goat biles, where relatively saturated phospholipid dissolved markedly lower amounts of cholesterol in the micelles.

The main conclusions of the study are as follows:

Intake of unsaturated lipids in the form of oil or phospholipids increases the rate of bile flow, unsaturation of the biliary phospholipids and excretion of cholesterol through the bile. Some proportions of the dietary lecithin are probably absorbed intact and contribute to the biliary lecithin pool. An increase in the unsaturation of the biliary phospholipids leads to increased solubilization of cholesterol in the bile, thereby eliminating into intestine via bile more cholesterol, a part of which is eventually lost through faeces.

Glutamine Synthetase from Mung Bean Seedlings

Glutamine plays an important role in the nitrogen metabolism. The amide nitrogen of glutamine is the preferred source of nitrogen in the biosynthesis of several purines, pyrimidines, amino acids, glucosamine-6-phosphate and DPN. In view of its role in the formation of several amino acids, nucleotides and glucosamine-6-phosphate, it is evident that glutamine synthetase is under cellular control.

Ms S. Seethalakshmi (a CSIR research fellow), who worked under the guidance of Dr N. Appaji Rao at the Indian Institute of Science, Bangalore, carried out studies on glutamine synthetase from *Phaseolus aureus* (mung bean) seedlings. Glutamine synthetase from mung bean seedlings was purified to homogeneity. The various purification steps involved protamine sulphate treatment, ammonium sulphate fractionation, negative adsorption on alumina-C₁₈ gel, DEAE cellulose chromatography, gel filtration on sephadex G-200 and affinity chromatography on histidine-sephadex resin. The enzyme displayed a single band on polyacrylamide gel electrophoresis at pH 8.6. The subunit composition of the enzyme was determined by SDS gel electrophoresis which revealed a single band, indicating that the enzyme is composed of identical subunits.

The bisubstrate kinetics of the transferase activity was examined. In reciprocal plots, parallel set of lines were obtained with both L-glutamine and hydroxylamine, indicating a ping-pong mechanism of catalysis. In the product inhibition studies, L-glutamine and γ -glutamyl hydroxamate pair, and hydroxylamine and ammonia pair had competitive inhibition, and in each case the product inhibition was eliminated by saturation with the nonvaried substrate. This steady-state kinetics of γ -glutamyltransferase reaction is consistent with a ping-pong mechanism.

The enzyme activity may be regulated by alanine, glycine, histidine, AMP and ADP. While alanine, glycine and histidine are partial inhibitors, AMP and ADP are complete inhibitors of the enzyme activity.

A comparison of the inhibition by these inhibitors at saturating and unsaturating concentration of the substrates revealed that alanine, glycine and histidine were more effective at unsaturating concentrations of glutamate than at saturating concentration of glutamate. AMP and ADP were more potent at unsaturating concentration than at saturating concentration of ATP. In other words, the amino acid inhibitors were interacting with the binding site of glutamate and the nucleotides were interacting with the binding site of ATP.

The kinetics of inhibitions by these inhibitors revealed that alanine was a partial noncompetitive inhibitor, histidine a partial competitive inhibitor, and glycine a mixed type inhibitor with respect to L-glutamate. AMP and ADP were found to be competitive inhibitors with respect to ATP.

Multiple inhibition analysis for alanine, glycine and histidine suggested that these amino acid inhibitors possessed separate and nonexclusive binding sites, and AMP and ADP possessed mutually exclusive binding sites. These inhibitors were found to inhibit the enzyme in a cumulative manner.

PERSONNEL NEWS

Appointments/Promotions

Dr K.R. Khanna

Dr K.R. Khanna of the National Botanic Gardens (NBG), Lucknow, has been appointed, on promotion, Scientist EI with effect from 1 August 1977.

Born on 5 October 1936, Khanna obtained his doctorate degree from the Panjab University in 1960 and worked on haploids at the Indian Agricultural Research Institute, New Delhi, during 1960-62. Proceeding to USA, he worked on cytology of the mosses of Rocky Mountains as the principal investigator under a National Science Foundation grant and taught an advanced course on 'Genetics of Bryophytes', jointly with Prof. Antero Vaarama, at the University of Colorado, Boulder (1963-65). Earlier, he had compiled a monograph on the genus *Cremolobus* at the Harvard University (1962-63). Khanna participated in the annual conventions of the American Institute of Biological Sciences (1963 and 1965) and the American Association for the Advancement of Science (1963).

Joining NBG in 1966 as scientist, Dr Khanna started working on heterosis breeding and biometrical genetics of horticultural and medicinal plants. He has developed four varieties in roses, highly heterotic hybrids in tomato, dwarf sunflowers and important genetic stocks in opium poppy and *Solanum khasianum*. His team showed for the first time that *Dioscorea floribunda*, the important steroid plant from Mexico, can be successfully grown commercially in the Indo-Gangetic plains.

At present Dr Khanna's team is studying the genetic upgrading of medicinal plants, particularly the steroid bearing plants, and opium poppy.

Dr Khanna has 55 research publications to his credit, and guided five Ph.D. students.

Symposium on Electron Devices
The Central Electronics Engineering Research Institute, Pilani, is organizing

a three-day symposium on 'Electron Devices' in the second half of September 1978. The symposium will cover the following areas: (i) High power and microwave tubes, (ii) Semiconductor power and microwave devices, (iii) Integrated circuit technology (monolithic and hybrid), and (iv) Special devices and emerging technologies (e.g. optoelectronic devices, SAW devices, CCDs, amorphous semiconductor devices, solar cells, etc.).

Abstracts are to be sent immediately. The last date for receipt of extended abstracts is 15 July.

Further particulars can be had from: Dr K.S. Srinivas, Head, I P & L Group, Central Electronics Engineering Research Institute, Pilani 333031.

PATENTS FILED

90/Del/78 : A method for the extraction of copper, nickel and cobalt from copper converter and smelter slags, S. Anand, P. K. Rao & P.K. Jena - RRL, Bhubaneswar.

105/Del/78 : Improvements in or relating to corrosion monitoring probes, K.S. Rajagopalan & N.S. Rangaswamy - CECRI, Karaikudi.

147/Del/78 : Improvements in or relating to electrolytic reduction of 2-nitro-m-xylene to 2-amino-m-xylene, H.V.K. Udupa, P.N. Anantharaman & M. Noel-CECRI, Karaikudi.

150/Del/78 : A process for preparation of a blasting agent for mining, tunnelling and other excavation work, P.K. Dutta, A. Bagchi, B.K. Burman & S. Bagchi-CMRS, Dhanbad.

151/Del/78 : Improvements in or relating to winning nickel from serpentine containing traces of nickel, A.B. Mukherjee & D.C. Ghosh (CSIR scheme)-IIT, Kharagpur.

197/Del/78: A process for deoiling of crude microcrystalline wax, K.M. Agrawal, R.C. Ghildiyal & Yogahora Kumar — IIP, Dehra Dun.

218/Del/78: Triple roller extractor, M.S. Laul, N.P. Childyal, B.D. Bhale-
rao, S.V. Ramakrishna & B.L. Amla — CFTRI, Mysore.

CSIR (PID) PUBLICATIONS

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Vol. X (Sp—W)	152.00	65.00	23.00	Vol. I	38.00	16.00	6.50
Vol. XI (X—Z)	102.00	42.00	20.00	Vol. II	38.00	15.00	6.00
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				Livestock (Kukkut Palan)	34.00	15.00	6.00
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OTHER PUBLICATIONS

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Supplement to Glossary of Indian Medicinal Plants by R.N. Chopra, I.C. Chopra & B.S. Verma	14.00	4.50	1.40
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Herbaceous Flora of Dehra Dun by C.R. Babu	144.00	60.00	22.00
Taxonomy of Indian Mosses by R.S. Chopra	96.00	38.00	15.00

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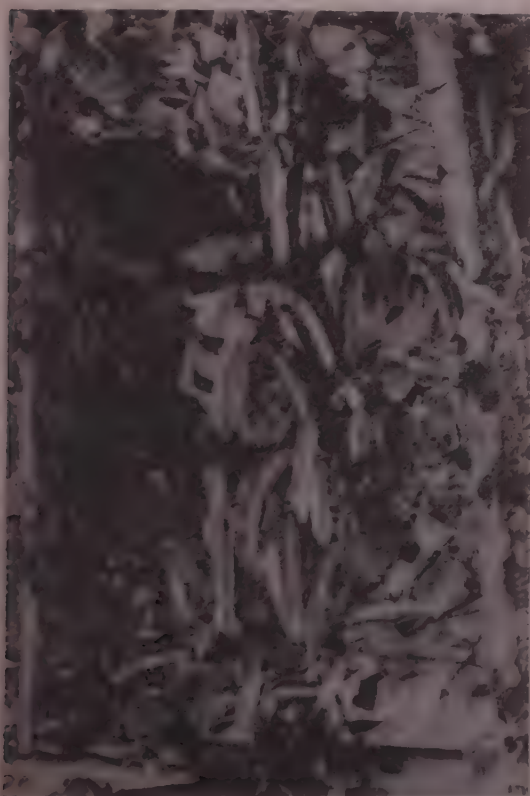
CSIR NEWS

VOL. 25 NO. 11 23 JUNE 1976
A FORTNIGHTLY HOUSE BULLETIN OF CSIR

NBG Introduces Winged Bean in Uttar Pradesh

A highly proteinaceous legume, Winged Bean (*Psophocarpus tetragonolobus*) is one of the under-exploited tropical plants. It is grown only as a backyard crop in a few parts of the world, such as Papua New Guinea, some parts of South East Asia and Sri Lanka. In view of its high protein content (30-37%), the National Botanic Gardens (NBG), Lucknow, carried out field trials on its introduction in the North Indian plains using seeds procured from Papua New Guinea. The field trials were a great success.

Sown with the onset of monsoon, at a variety of situations from sandy loam to clay loam, the plant comes up very well.



Winged Bean under cultivation at the Banthra Research Station of NBG, Lucknow.

grows luxuriously and shows profuse flowering and fruiting. The bean varies in length from 6 to 26 cm and is the main edible part of the plant. It can be cooked as a vegetable like any other bean and can also be used as salad because of its juicy and fleshy nature. All the other parts of the plant are also edible and can be used for making a variety of preparations.

At a function held in connection with the annual day, Dr T.N. Khoshoo, Director of NBG, presented one quintal of seed (1000 packs of 100 g each) to Shri S.K. Bhatnagar, Agriculture Production Commissioner of Uttar Pradesh, who received it on behalf of the state government. The seed was intended for distribution among the farmers of various development blocks in the state, and along with seed packet was an extension folder, describing the nutritional importance of the vegetable, agro-technique for its cultivation, and plant-protection methods.

Cultivation of *Dioscorea* in North-Eastern Region

Investigations carried out at the Regional Research Laboratory (RRL), Jorhat, have shown that *Dioscorea composita* Hemsl, an excellent source of diosgenin, can be profitably cultivated in the north-eastern region of India.

The laboratory obtained in 1968 some *D. composita* Hemsl planting materials from the USDA Research Station, Puerto Rico, South America, and introduced it in the laboratory farm at Jorhat. Research carried out during the last few years has enabled RRL to develop farm technology for *D.*

composita. Farming trials conducted at the laboratory showed that the average weight of tuber per plant is about 10 kg and 14 kg in 2 years and 3 years respectively, with diosgenin content ranging from 2.5 to 2.9% on dry weight basis. One hectare of land can produce about 43,120 kg and 61,600 kg of tuber in 2 years and 3 years respectively. These may yield 267 kg and 385 kg of diosgenin (2.5%) valued at Rs 2.14 lakh and Rs 3.08 lakh respectively. The annual profit per hectare at the prevailing market price ranges between Rs 15,000 and 17,000.

Diosgenin derived from the tubers of *Dioscorea* species is a valuable material for synthesis of steroids. There is an acute shortage of diosgenin all over the world. India's demand for diosgenin is estimated at about 100 tonnes, of which only about 10 tonnes are produced in the country. Large-scale cultivation of *Dioscorea* and *Solanum* species has been accorded high priority by the National Committee on Science and Technology. Accordingly, the laboratory has intensified its efforts for the development of farm technology for various species of *Dioscorea* and *Solanum*. The agro-climatic condition of the north-eastern region appears to be ideally suited for commercial cultivation of some of these species.

New CIMPO Centre at Kodaikanal

A new regional centre of the Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has been started in the Berijam Lake area near Kodaikanal

of Madurai District. The Forest and Fisheries Department of the Government of Tamil Nadu has handed over 40 ha of forest land for the centre.

The agroclimatic conditions of Kodaikanal area, located in the Palni Hills, are ideal for the cultivation of pyrethrum as well as some essential oil bearing plants. The area has a climate identical to that of the hills of Kenya and surrounding African states, where about 80% of the total pyrethrum requirement of the world is produced. The average yield of pyrethrum flowers as also the pyrethrin content of flowers cultivated in Palni Hills are higher by 2-3 tonnes and 50% respectively than those of flowers from Kashmir Valley.

This regional centre would also carry out research and development work on geranium and other important medicinal and essential oil bearing plants.

IFS Grant to RRL, Jorhat

The Regional Research Laboratory (RRL), Jorhat, has received a grant of \$ 3800 at the first instance, by the International Foundation for Science (IFS), Sweden, for its research project. The project envisages survey and screening of plants growing wild in the north-eastern region and known to bear pesticidal properties and hence used by the local population. The project also envisages extraction of active principles, and their identification and comparative evaluation with known synthetic pesticides.

Prof. F. Sandberg of the Uppsala University, Sweden, and a member of the Scientific Committee for National Products Research of IFS, who visited the laboratory on 21-22 March 1978, discussed with the RRL scientists the operational aspects of the project.

CSIR-TBTAK Cooperation Programme

In pursuance of the protocol on scientific and technological cooperation programme between the Council of

Scientific & Industrial Research (CSIR) and the Scientific & Technical Research Council of Turkey (TBTAK) signed in New Delhi on 23 March 1977 and under the India-UNIDO Agreement on Technology Transfer, an eight-member Indian delegation visited Turkey from 23 January to 2 February 1978. The delegation, led by Dr A.R. Verma, Director, National Physical Laboratory, New Delhi, visited a number of research organizations, universities and industrial units in Ankara, Izmir and Istanbul and held discussions with various government agencies, scientific institutions and private and public sector corporations.

The delegation finalized a list of tentative areas of cooperation for consideration by the Joint Committee (to be established in accordance with the protocol between TBTAK and CSIR). Some of the important areas identified are: systems engineering and softwares; microprocessor based systems; solar energy and its applications; data communication systems; polymer sciences; environmental engineering; cultivation and propagation of *Mentha* and evaluation of mint content; liquid fruits (processing and methods of production); infant weaning and supplementary foods (using locally available raw materials); utilization of wastes and byproducts for production of single cell proteins and microbial fats; isolation of proteins from oil cakes; packaging materials; metal cutting technology; liquid crystals; utilization of mineral resources and byproducts of mineral industries; and training in design and operation of pilot plants, and non-destructive testing of materials.

The memorandum of understanding signed at the end of the Indian delegation's visit further provides that the Joint Committee should meet before the end of 1978 and decide and initiate programmes for research cooperation in the fields identified. The delegation also identified institutions in Turkey and their counterparts in India which will cooperate in various research

programmes as well as in exchange of information

Besides the leader of the delegation, there were five other members from CSIR: Dr V.A. Altekar (Director, NML); Dr S.K. Basu (Director, CMERI); Dr Raghavendra Rao (CFTRI); Dr R.A. Mashalkar (NCL); and Dr H.R. Bhojwani (CSIR Headquarters).

Contribution of Science, Engineering and Technology in Rural Development

Get-together at CBRI, Roorkee

A get-together on 'Contribution of Science, Engineering and Technology in Rural Development' was organized by the Central Building Research Institute (CBRI), Roorkee, on 24-25 April 1978 in collaboration with Kendriya Sachivalaya Hindi Parishad (Roorkee Branch) and University of Roorkee. More than 250 delegates from different parts of the country participated in the get-together, which was spread over four technical and two non-technical sessions. Forty-four papers were presented, broadly covering Rural housing; Energy conservation; Small-scale and cottage industries; Water supply and environment; Community development; and Mass communication.

The get-together, the main objective of which was to promote the use of Hindi in carrying science and technology to the rural areas, was inaugurated by Dr Atma Ram, Chairman, National Committee on Science and Technology. In his address, Dr Atma Ram called upon the scientists and engineers to develop appropriate technologies which could be easily adopted by the villagers. He also called upon the scientists to explain the techniques and devices to the villagers in their own language.

Earlier, in his welcome address, Prof. Dinesh Mohan, Director of CBRI, highlighted the work of the institute on rural housing and advocated the use of

Hindi in science and engineering, especially in the context of rural development.

Prof. Jagdish Narayan, Vice Chancellor, University of Roorkee, laid stress on establishing a number of cottage industries in the villages so as to generate employment and check the exodus of villagers to the cities, which were being turned into slums.

Prof. Shital Prasad, ex-Vice Chancellor of Agra University, who presided over one of the sessions, stressed the need for proper implementation of rural development schemes.

The get-together recommended (i) formation of a forum for scientists, engineers and technologists to discuss scientific topics in Hindi and other languages; (ii) establishment of appropriate cottage and small-scale industries in villages with emphasis on the utilization of wastes; and (iii) formulation of rural housing schemes based on local resources and materials, with particular attention to cleaning and housing. In one of its recommendations, the get-together called upon various institutions in Roorkee to draw up integrated development schemes and try to implement them in the Roorkee region.

Citrate Lyase from *Streptococcus faecalis*

Studies on the purification and properties of the bacterial enzyme citrate lyase (EC 4.1.3.6) from *Streptococcus faecalis* were carried out by Shri S.T. Hiremath, a CSIR research fellow, who worked under the guidance of Dr C. Sivaraman, at the Biochemistry Division of the National Chemical Laboratory, Poona, from December 1973 to September 1977.

Citrate lyase catalyses the cleavage of citrate to oxaloacetate (OAA) and acetate in the presence of divalent metal ions. Considerable interest has been focussed on this enzyme in recent years with the discovery of the multienzyme nature of the citrate lyase complex from

Klebsiella aerogenes and the involvement of an acyl carrier protein (ACP) subunit with a novel covalently bound prosthetic group, phosphoribosyldephosphocoenzyme A. In the active enzyme, the ACP subunit carries an essential acetyl group in thioester linkage with the CoA moiety and in the course of the reaction this apparently exchanges with the substrate under the effect of a second type of subunit. The citryl-intermediate is then cleaved back to the acetyl-ACP with release of OAA under the influence of a third and distinct subunit. The *K. aerogenes* enzyme is rapidly converted to an inactive deacetyl form in the course of this reaction, a process which has been termed as enzyme 'suicide'.

S. faecalis citrate lyase was obtained pure for the first time and shown to be distinct from the other enzymes of this group in some of its properties. The pure enzyme, which was ultracentrifugally and electrophoretically homogeneous, was shown to have a molecular weight of 6,00,000 and to contain three non-identical subunits of 54,000, 37,000 and 14,000 daltons. Unlike the *K. aerogenes* enzyme, *S. faecalis* citrate lyase undergoes only a slow reaction — deacetylation. The *S. faecalis* enzyme, however, contains no associated ligase activity for the reacetylation of the deacetyl form of the enzyme, a condition which has been postulated hitherto as a prerequisite for the stable enzymes of this group.

A new preparative method for the complete separation of the three different subunits of the *S. faecalis* citrate lyase complex was developed. The amino acid analysis of the separated subunits established the existence of an acetylated cysteine residue in the ACP subunit in addition to the acetylated prosthetic group moiety. Although citrate lyase from *S. faecalis* resembles that from *K. aerogenes* in molecular size, subunit structure, subunit size and stoichiometry, the individual subunits of the two complexes show distinct differences in their amino acid make-up.

An intriguing feature of both the *K. aerogenes* and the *S. faecalis* enzymes is the presence of only four prosthetic groups, although a total of six ACP subunits exist in the holoenzyme molecule. Two of the ACP subunits in the complex are evidently devoid of attached CoA moieties.

Hiremath was awarded Ph.D. degree of the University of Poona for his thesis based on the studies relating to *S. faecalis* citrate lyase.

PROGRESS REPORTS

NML Annual Report: 1976-77

The annual report of the National Metallurgical Laboratory (NML), Jamshedpur, for 1976-77, brought out recently, shows that the laboratory continued its R & D activities in the following areas: Ore dressing and mineral beneficiation; Refractories technology; Extraction and chemical metallurgy; Iron and steel technology; Development of alloys; Development of magnetic materials; Heat treatment and mechanical working of metals; Testing of materials; Metallurgical studies on metals and alloys; Foundry technology; Corrosion studies on metals and alloys; and Surface coating on metals.

The laboratory entered into an agreement with Metallurgical & Engineering Consultants (India) Ltd (MECON) for promoting the development of metallurgical industries from research and development level to a commercial scale. A 1000 tonnes per annum electrolytic manganese dioxide plant based on NML know-how was under installation by T.K. Chemicals Ltd at Trivandrum. NML provided consultancy services to S.G. Enterprise, Ranchi, on the design, specifications of equipment, etc. for recovery of vanadium pentoxide from alumina sludge using NML process. The plant is expected to produce 54 tonnes of vanadium pentoxide from HINDALCO sludge. The laboratory assisted Rajasthan Graphite (P) Ltd, Calcutta, in setting up a graphite

beneficiation plant at Udaipur. The laboratory also assisted M.N. Dastur & Co. in evaluation of iron ores and limestone from Nepal for the production of basic-grade pig iron suitable for L.D. process of steel-making and electric smelting of the raw materials. A steel plant is being set up in Nepal by the firm.

Laboratory experiments on the recovery of vanadium pentoxide from vanadium bearing slag obtained from Visvesvaraya Iron & Steel Works were encouraging.

Beneficiation and agglomeration studies were conducted on iron ore, copper ore, lead-zinc ore, graphite, magnesite, manganese ore, rock phosphate, kyanite, fluorspar, etc. on behalf of the National Mineral Development Corporation; Hindustan Copper Ltd; Bharat Coking Coal Ltd; Pyrites, Phosphates & Chemicals Ltd; Geological Survey of India; Rajasthan State Mines & Minerals Ltd; Andhra Pradesh Industrial Development Corporation; Bihar State Mineral Development Corporation; Nepal Bureau of Mines; and many other organizations.

A new process, NML-ALNAMA, has been developed for the extraction of lead from lead concentrates. Experiments were completed on large scale in an oil-fired crucible furnace, treating about one tonne of concentrate per day to obtain design data for a commercial plant. Smelting trials were also conducted by electrothermal process in an arc furnace.

Clay-graphite stopper heads were developed at NML from indigenous raw materials for use in steel pouring operation. Samples have been supplied to sponsor, Patna State Graphite Mining Co., Titilagarh, for evaluation and service trials.

The production of NML-PM2 alloy was continued at the works of Aluminium Cables & Conductors (UP) Pvt Ltd, Calcutta, and Galada Continuous Castings Ltd, Hyderabad. The alloy was being used in coach wiring

cables, overhead ACSR conductors, welding cables, power cables, etc.

The NML technology for the production of dental amalgam alloy was transferred through the National Research Development Corporation of India to two entrepreneurs; one of them started production. Attempts were being made to develop a cheaper dental amalgam alloy containing less silver.

High-temperature properties such as retained strength and high-temperature strength of the sodium silicate bonded sand hardened by the NML self-setting agent were determined. The effect of different additions, such as dextrine, coal dust, molasses and sulphite sand dust, on the high-temperature properties was examined.

The development and testing of high-temperature creep resistant steels in accordance with the agreement with Bharat Heavy Electricals Ltd was progressing satisfactorily. The laboratory also assisted the Reactor Research Centre, Kalpakkam, in the testing of creep behaviour of structural components of the test reactor being built there.

Six patents were filed, and one patent relating to the manufacturing process of aluminium alloy for multifarious applications was sealed. Fourteen NML processes were ready for release to industry. The total number of research papers published, including those presented at conferences, was 94.

IIEM Annual Report: 1976

The Indian Institute of Experimental Medicine (IIEM), Calcutta, has brought out its annual report for 1976. The 70-page report (mimeographed) shows that the institute's research programme comprised 20 projects. Work was continued on three projects, started earlier under the purview of the coordination council for biological sciences, on fungal acid protease; follow-up chemical investigation of Indian medicinal plants identified in the preliminary screening programme of the Central Drug Research Institute,

Lucknow, and the Regional Research Laboratory, Jammu; and experimental cultivation of *Dioscorea* yams of high diosgenin content and analysis of various samples for diosgenin content. Work on toxæmia of pregnancy, started earlier in collaboration with the Department of Gynaecology and Obstetrics, Medical College, Calcutta, was also continued.

A patent (Indian Pat. 139136) covering the process developed at IIEM for the production of diosgenin from *Kallstroemia pubescens* (G. Don) Dandy was filed and accepted. This plant, which grows wild in the eastern region of India at Gangetic beds, has been identified by IIEM as a good source of diosgenin. The ease of its cultivation, collection and processing makes it a useful commercial source of diosgenin.

Two new stereoisomeric alkaloids were isolated from *Solanum pseudocapsicum* and their structures deduced to be 3-amino-16,23-dihydroxy-22,26-epiminocholestane. The complete stereochemistry of one of the compounds has been established by correlation with solanocapsine. From *Solanum vegum* two stereoisomeric alkaloids were isolated and their structures established as 3 α -amino- and 3- β -amino-2 β -hydroxylsolanidane.

One of the active principles of *Aristolochia indica* which showed promising antifertility effects in experimental animals was identified as 3,4-methylenedioxy-8-methoxy-phenanthrene-1-carboxylic acid. The methyl ester and amide of this compound were also isolated.

Systematic investigation on Parkinson's disease employing the 'oxotremorine model' of the disease in the experimental animals has thrown new light on the origin of tremor and other motor disorders associated with the disease. Spinal motor mechanisms of control and both the extrafusal and intrafusal skeletal neuromuscular transmission processes at peripheral level were shown to contribute to the genesis of Parkinson-like motor disturbances.

The mechanism of interaction of the drug furazolidone with DNA was investigated. Photobiological activity of furazolidone, hitherto unknown, was observed. This property of furazolidone will be of help in future therapeutic use of this drug.

The role of erythropoietin in the metabolism was studied. Some of the results obtained show a specific role of this hormone in the metabolism of thyroid such as in the process involved in iodination in thyroxine biosynthesis.

The laboratory made a significant contribution to the metabolism of monoamines; it has shown that there are two mechanisms through which these monoamines are oxidized. This is important because the MAO inhibitors are used as drugs in mental diseases.

The biochemical changes underlying the delayed neurotoxic effect of triorthocresyl phosphate (TOCP) and its species specificity were being investigated in view of the public health interest in TOCP paralysis, cases of which continue to occur.

Forty-one research papers were published and 24 papers were presented at conferences, symposia and seminars.

SASMIRA Annual Report: 1976-77

The programme of work of the Silk and Art Silk Mills' Research Association (Sasmira), Bombay, included R & D projects, fabrication of textile testing instruments, techno-economic and market studies, technical consultancy services, testing of textile and allied products, imparting technical education and organizing seminars on topics of interest to the industry, according to its annual report for 1976-77 brought out recently.

Work on three applied research projects was under way. These were: (i) development of soil-release finish; (ii) development of drip-dry and/or anti-crease finishes for silk fabrics; and (iii) spinning and weaving of silk blended with synthetic fibres for dress materials.

The last two were sponsored by the Central Silk Board.

A market study to evaluate the demand for polyester staple fibre in India was completed under the sponsorship of a firm. The various aspects examined under the study were: production capacity of the existing plants, utility of the fibre for fabric production by the various sectors of the textile industry, and the potential future demand.

Consumers' attitudes and preferences in selection of textiles for various end uses were evaluated through a survey.

Technical service to the industry forms an important part of Sasmira's activities. During the year, 202 fabrics were investigated for defects such as mix-up of fibres/yarns, yarn preparation, texturizing, weaving and construction, and wet-processing.

CSIR SUPPORT TO RESEARCH Nonlinear Analysis of Reinforced Concrete Framed Structures

A study of the performance of four plane-stress elements (three displacement models and one hybrid model) for nonlinear analysis of reinforced concrete framed structures was carried out by Shri A. Panneerselvam, a CSIR senior research fellow working at the Department of Civil Engineering of the Indian Institute of Technology (IIT), Madras. Shri Panneerselvam worked under the guidance of Dr C.S. Krishnamoorthy, Assistant Professor of the department. Steel reinforcement was idealized to be 1-D bar element, and two separate computer programmes (one for displacement formulation and the other for hybrid formulation) with 'initial stress' method of analysis were developed for the study. The 4-node isoparametric quadrilateral with incompatible modes was found good for predicting the nonlinear response of the reinforced concrete framed structures.

A reinforced concrete element using the 4-node isoparametric quadrilateral

Samples of textile and allied products tested for physical and chemical properties at Sasmira numbered 2266.

Sixty-four textile testing instruments, fabricated at Sasmira, were supplied to different users during the year.

Under Sasmira's technical education programme, two new certificate courses on dyeing and finishing of wool and warp-knitting of man-made textiles, and a post-graduate diploma course on management and marketing of man-made textiles were started.

The second edition of the book 'Man-made Fibres: Cellulosic and Synthetic' and a souvenir 'Man-made Fibres for Developing Countries' containing the proceedings of the international conference on Man-made Fibres for Developing Countries were published.

with incompatible modes was developed for nonlinear analysis. The element included reinforcement in any orientation, and the sub-regioning of element was included for computational economy. The nonlinear analysis included nonlinear stress-strain law for concrete cracking and yielding of concrete and yielding of steel. The uniaxial stress-strain law for concrete was represented by parabola-rectangle. Octahedral shear stress and shear strain criteria were used for biaxial yielding and crushing of concrete. Boundary elements were introduced for reaction computation and 'initial stress' method of approach for the incremental-iterative procedure was used in the analysis.

A computer programme, FEPACS, using the reinforced concrete element and 'initial stress' method was developed for nonlinear analysis of reinforced concrete framed structures. The programme can be used to trace the load-deformation response and crack propagation through the elastic and inelastic ranges. The concrete and steel

stresses can also be determined for any stage of loading.

Panneerselvam carried out an experimental investigation on four continuous beams and three portal frames. The two-span continuous beams consisting of two rectangular beams and two Tee-beams were subjected to eight concentrated loads and the two-hinged portal frames were loaded at the centre of the beam. All the specimens were tested to failure, and data on load deflection response, strain variations, ultimate loads and crack propagation were recorded.

The validity of the proposed finite element formulation was studied using the programme FEPACS. This programme was used to analyze 10 experimental specimens. The analytical results regarding the load deflection response, reaction values, ultimate load, strain variations and crack propagation were compared with the experimental values.

For the analysis of large frames, Panneerselvam developed a layered frame which provided a simplified model for the nonlinear analysis of framed structures with increased computational efficiency. The 'initial stress' method was used in the incremental iterative procedure. A computer programme, FELPRO, using the frame element was developed for the nonlinear analysis. The adequacy of the proposed model was established by analyzing four portal frames. A simplified approach for elastic analysis under ultimate load conditions based on modified flexural rigidity of members was also devised.

The study points to the conclusion that the finite element formulation using the proposed reinforced concrete element gives very good results for the nonlinear analysis of reinforced concrete framed structures at various stages of loading up to failure. The simplified model with frame element provides an efficient formulation for the analysis of large frames.

The modified flexural rigidity approach provides a single step elastic

analysis of reinforced concrete frames at the ultimate load condition. This approach will be quite useful for practical designs of large frames when it is not possible to go for a rigorous nonlinear analysis involving large computational effort.

Shri Panneerselvam was awarded Ph.D. degree of IIT, Madras, for his thesis based on these studies.

Surface Characteristics and Surface Behaviour of Polymer Carbons

Carbons obtained on charring organic polymers and thermosetting resins have reproducible characteristics and uniform pore size and shape, which they inherit from the regular structure of their polymer predecessors, and have great potential as carbon molecular sieves. These sieves have advantages over zeolitic sieves, such as better stability at higher temperatures and in strong acidic medium, low water take-up and no promotion of polymerization of olifinic monomers. Shri T.L. Dhama, a CSIR senior research fellow, who worked at the Department of Chemistry, Panjab University, Chandigarh, has prepared char from five different polymeric compounds, viz. polyvinyl chloride (PVC), polyvinylidene chloride (PVDC), Saran — a copolymer of vinylidene chloride and vinyl chloride, polyfurfuryl alcohol (PFA) and urea-formaldehyde (UF) under varying conditions of temperature and atmosphere.

The characterization of polymer carbons as molecular sieve materials has been carried out by studying the adsorption of organic vapours representing a wide range of molecular sizes and shapes as molecular probes. The surface areas of PVDC and Saran charcoals, calculated by the adsorption of nitrogen and carbon dioxide, gave similar values. However, the two values differed appreciably in the case of PFA, UF and PVC charcoals. The surface areas generally decrease with increase in the molecular dimensions of the adsorbate. Iso-octane and α -pinene

could cover only 12% and 7% of the total surface covered by nitrogen or carbon dioxide in the case of PVDC charcoal.

The pore volume values were quite high (0.3-0.4 ml/g) when calculated by adsorption of molecules with diameters of less than 5 Å. However, when the pore volume for the same charcoal was calculated from adsorption of molecules with diameters of more than 5 Å, the values were found to be much smaller (0.05 - 0.15 ml/g), indicating that only a small fraction of the pores are available for the adsorption of larger molecules. PVDC and Saran charcoals showed a screening effect towards the adsorption of α -pinene (molecular diameter 8 Å) indicating that these samples predominantly contain pores with diameters in the range 10-12 Å. Similar observations in the case of PFA, UF and PVC charcoals showed that they contain pores in the range 5-6 Å since they could adsorb none of the adsorbates with diameters greater than 5 Å in appreciable amounts.

PERSONNEL NEWS

Appointments/Promotions

Dr A.Roy, Acting Director of NGRI

Dr A. Roy, Scientist F, National Geophysical Research Institute (NGRI), Hyderabad, has been appointed Acting Director of the institute with effect from 12 May 1978, consequent on Dr Hari Narain being relieved as Director. Dr Hari Narain, who has been appointed Vice Chancellor of the Banaras Hindu University, Varanasi, will be on deputation for a period of three years on foreign service terms with effect from 13 May 1978.

Dr R.L. Thakur

Dr R.L. Thakur of the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has been promoted as Scientist F with effect from 15 April 1978. Dr Thakur (born 31 Oct. 1920) obtained B.Sc. from the Patna University, B.Sc. (Tech.) from the

Banaras Hindu University, M.S. from the Alfred University, and Ph.D. from the Pennsylvania State University, USA. At Penn State University he worked with Prof. W.A. Weyl on the colour of minerals and the effects of noble and non-noble gas-type ions on the low-temperature viscosity of



Dr R.L. Thakur

silicates. At the College of Physics of Penn State University he carried out research on the development of ferro electric materials and materials of high dielectric constant.

Joining CGCRI in 1953, Dr Thakur became Scientist E in 1962. Dr Thakur has been responsible for organizing the Scientific Information Services of CGCRI. Also to his credit stands the setting up of the Solid State Studies Laboratory of the institute in which he has been directing, coordinating and conducting researches in solid state reactions, nucleation and controlled crystallization. Dr Thakur has developed glass-ceramics possessing high chemical resistance and abrasion resistance and suitable for lining coke oven chutes, from industrial slags and inexpensive rocks. A small-scale plant for production of this material has been set up at Belur by the Garden Reach Shipbuilders and Engineers. Machinable glass-ceramics, zero thermal expansion glass-ceramics, glass-ceramics for use in building electronics and household industries, and photochromic glasses are some of the other new materials developed by him. In association with Dr S. Thiagarajan, Dr Thakur developed a new technique for ascertaining the efficiency of nucleating agents for glass-ceramics.

Dr Thakur is a fellow and founder-member of the Indian Institute of Ceramics and has been on the council of the Indian Ceramic Society for a number of years. He is a member of the American science-honour societies: the Keramos (ceramics), Phi Lambda

Upsilon (chemistry), Sigma Gamma Epsilon (earth sciences), Sigma Pi Sigma, and Sigma Xi (science research). Dr Thakur is the founder editor of *Central Glass & Ceramic Research Institute Bulletin*. He is on the international editorial board of *International Journal of High Temperatures and Refractories* and of *Ceramurgia International*. Dr Thakur has visited important research and industrial centres in USA, UK, Holland, Germany, France, Canada, Japan and USSR.

Shri T.N. Rajan

Shri T.N. Rajan, Scientist C of the Indian National Scientific Documentation Centre (Insdoc), New Delhi, has been promoted, consequent on assessment, as Scientist EI with effect from 1 March 1976.

Shri Rajan (born 1928) had his academic (MA) and initial professional (Dip.Lib.Sc.) education at the Madras University. As a fellow of the Rockefeller Foundation he studied for his Master of Science in library services at the Columbia University in New York in 1960.

Shri Rajan joined Insdoc in March 1964 as Scientist C and has been responsible as the head of the training course in Documentation and Reprography for its planning, designing and developing from its very inception in August 1964. Over the years he has developed the course, now designated as training course in Information Science, in conformity with the changing dimensions of the information field so as to make it possible to supply the much-needed information specialists to national laboratories, industrial undertakings, government departments in the country and a few other developing countries.

Shri Rajan has taught library and information science at the Delhi University, DST short courses, user training courses and such others. He has been associated with a number of universities either as examiner at M. Lib. Sc. courses or as member of the board of studies.

He has also been actively associated in Insdoc's consultancy services for planning and designing information units, designing indexing systems, and short-term training courses, etc. He has participated in a number of national and international conferences.

In 1970 Shri Rajan participated in a three-month training programme in industrial information sponsored by Unesco-UNIDO and organized by VINITI at Moscow.

Prior to joining Insdoc, Shri Rajan was a lecturer at the Department of Library Science of the Madras University (1960-64). He also served the Library of Congress, Washington (1957-58) for fourteen months, as a participant in the jointly sponsored programme of the US State Department, the American Library Association and the Special Library Association. He was assistant editor of *Indian National Bibliography* for two years (1956-57) at the National Library, Calcutta. He started his career as a Librarian at Vivekananda College, Madras, in 1951.

He has visited libraries, information centres and other institutions in USA and Europe. He has about 50 publications to his credit.

Shri A.S. Raizada

Shri Ajay S. Raizada, Scientist C, Insdoc, New Delhi, has been promoted, consequent on assessment, as Scientist EI with effect from 1 August 1976.

Shri Raizada (born 23 July 1933, Mainpuri) obtained his M.Sc.(physics) from the Agra College (Agra University), Agra, in 1954. Joining Insdoc in 1954, he became Scientist C in 1964.

Shri Raizada has had special training in library science at the Delhi University (1959-60) and Documentation Research & Training Centre, Bangalore (1962-63). On deputation as associate librarian at the Indian Institute of Technology, Delhi, he was responsible for planning new library services and mechanization of information services (1971-73).

At Insdoc he developed documentation systems for a number of CSIR laboratories, like NML, CLRI and NAL, and the Border Security Force, Delhi. During 1967 he did the spade work of conducting an all-India survey in connection with the setting up of a modern information grid for electronics.

Pioneering the use of computers in India during 1964, Shri Raizada has since been working on the application of computers to modernize information services in India. He has been teaching modern methods of information handling at the Insdoc training course in information science. He has planned, designed and executed Unesco pilot project on computer-based Selective Dissemination of Information. He was editor of *Indian Science Abstracts* for four years and developed many documentation projects including proposals for computerized data banks and information banks, computerized acquisition of journals, and on-going research projects.

During 1970 he visited USA and Canada for studying the latest methods of information handling prevalent in those countries. He attended the first steering committee meeting of UNISIST at Paris (1973) as professional delegate, and participated at the international conferences on computerized information systems in Stockholm (1974) and Rabath (1975).

During 1976-77 Shri Raizada was Unesco consultant for conducting training courses on information techniques and advising on documentation activities in Thailand, Malaysia and Philippines.

Shri Raizada is a member of IASLIC, Calcutta, Delhi Library Association, and Computer Society of India (CSI) as also founder-secretary of the Delhi Chapter of CSI and editor of the society's monthly newsletter.

Shri B. Guha

Shri B. Guha, Scientist C, Insdoc, New Delhi, has been promoted, consequent

on assessment, as Scientist EI with effect from 1 August 1977.

Shri Guha (born 1926) obtained M.Lib.Sc.(1950) from the Delhi University and worked from 1950 in the library of the Indian Statistical Institute, Calcutta, till he joined Insdoc in 1956. At Insdoc, he was associated with the editorial work of two bibliographical publications, viz. *INSDOC List* and *Bibliography of Scientific Publications of South and South-East Asia*.

Since 1965 Shri Guha has been working as a full-time faculty member of the Insdoc training course in information science. He has also been editing the *Annals of Library Science and Documentation*.

Shri Guha has delivered a number of lectures to the students of many library schools and also to the participants of a number of users' training courses organized by various institutions. He visited Tokyo, Paris and Dacca in connection with training programmes.

Shri Guha has written many editorials and book reviews and has 60 papers to his credit.

* * *

The following personnel have been promoted, consequent on five-year assessment, at the National Botanic Gardens, Lucknow: Shri P.N. Misra (as Scientist C, 28 July 1976); Dr Mohinder Pal (as Scientist C, 1 March 1977); Shri K.M. Balapure (as Scientist C, 11 April 1977); Dr N.C. Pathak (as Scientist C, 2 May 1977); Shri S.M. Andra (as Scientist C, 1 July 1977); Shri R.K. Tandon (as Scientist AI, 24 February 1976); Shri O.P. Saraswat (as Scientist AI, 12 October 1976).

Honours & Awards

Shri K. Sreenivasan, Director, South India Textile Research Association, Coimbatore, has been elected a Vice President of the Textile Institute, Manchester, for a three-year term. This is in recognition of his contribution to the advancement of knowledge and development of textile industry in India.

Shri S. Bagchi, Director, Central Mining Research Station (CMRS),

Dhanbad, and Dr D.N. Thakur, Scientist, CMRS, were awarded the Distinguished Alumni Award by the Indian School of Mines, Dhanbad, at its golden jubilee celebration held in March 1978.

PATENTS FILED

195/Del/78: Chemical modification of hides, skins and leathers by graft polymerization with vinyl monomers, K.P. Rao, K.T. Joseph & Y. Nayudamma — CLRI, Madras.

196/Del/78: An evaporator for producing fragmentary crystal clear ice, P.S. Parti & B.C. Mukherjee — CMERI, Durgapur.

226/Del/78: Improvements in or relating to the process for the recovery of copper from industrial byproduct copper compounds, H.V.K. Udupa, P.V. Vasudeva Rao, R. Vijayavalli & K. V. Venkateswaran — CECRI, Karaikudi.

250/Del/78: A process for obtaining hypolipaedemic and antiplatelet aggregation fraction, N.K. Kapoor, Sukh Dev & (Mrs) S. Nityanand — CDRI, Lucknow.

265/Del/78: A process for the preparation of new yellow naphthoquinoquinazolinone disperse dyes for polyester fibres, N.R. Ayyangar, R.J. Despande & D.R. Wagle — NCL, Poona.

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RRL-Bhubaneswar Bulletin

The Regional Research Laboratory (RRL), Bhubaneswar, has started bringing out a quarterly house bulletin. The first issue of the bulletin, dated April 1978, contains, among other items, a brief history of the laboratory; its current areas of work; and technologies transferred, or ready for transfer, to industries. Enquiries regarding the bulletin may be addressed to its editor, Shri J.R. Sahu, Scientist, Regional Research Laboratory, Bhubaneswar 751013.



Foundation Day, and Industry & Research Get-together at RRL, Bhubaneswar

The Regional Research Laboratory (RRL), Bhubaneswar, celebrated its fifteenth foundation day on 13 April 1978. An 'Industry and Research' get-together was also held on the same day.

Shri Bhagwat Dayal Sharma, Governor of Orissa, who inaugurated the foundation day celebrations, emphasized the need for developing technologies which could make judicious use of Orissa's abundant natural resources and could easily be adopted by the people of the state. He also called upon the scientists to develop technologies appropriate to the needs and skills of the communities, especially the tribals. The governor complimented the laboratory for the various processes and products developed by it.

In his welcome address, Prof. P.K. Jena, Director of RRL, outlined the achievements of the laboratory in the areas of mineral beneficiation, extraction of metals and preparation of composites and special materials, including inorganic chemicals. Prof. Jena said that while taking all steps to utilize the mineral resources the laboratory had given due emphasis to the utilization of forest, marine and agricultural resources of the region in order to develop cottage, small and medium scale industries, particularly in rural areas. Some of the projects in this direction are preparation of various types of papers from hardwood and agricultural waste; extraction of strychnine and brucine from nux vomica seeds, hecogenin from sisal juice and solasodine from *Solanum*

khasianum, and washing of sal seed cake for poultry and animal feed; production of fishmeal on cottage scale and on one tonne/day capacity plant; and cultivation of aromatic and medicinal plants.

The foundation day lecture was delivered by Dr R.V. Tamhankar, Chairman and Managing Director, Mishra Dhatu Nigam, Hyderabad.

In the Industry and Research get-together, the following CSIR processes were exposed to the industrialists and entrepreneurs: Ammonium vanadate from vanadium sludge, Synthetic iron oxide black and red, Low-ash carbon from coke breeze, Self-lubricating bearings from metal powders, Production of methyl and ethyl anthranilate from isatoic anhydride, Production of methaqualone and methaqualone hydrochloride, Commercial cultivation and production of *Solanum khasianum* at Bhubaneswar, Gamma-variety manganese dioxide, and Vanadium from vanadiferous magnetite (all developed at RRL, Bhubaneswar); Low-temperature carbonization of coal, and Sal seed processing (both developed at RRL, Hyderabad); Electrolytic manganese dioxide (CECRI, Karaikudi); and Smokeless domestic oven (version-II) (CMERI, Durgapur).

A panel discussion on the role of R & D institutions, industries, entrepreneurs, financial institutions and government in the rapid development of industries in the region was also held on the occasion.

The laboratory observed an 'open day' on 14 April 1978 when a large number of people visited the laboratory.

Silver-Impregnated Contacts

NPL's Technology Transferred to Industry
Various types of contacts are used in electrical gears, circuit breakers and relays to make or break electrical circuit or transfer contact from one element to another. The contact forms a sensitive part of the relay, and its satisfactory operation depends on the materials of the contact. The common contact materials are copper, silver and metals of high melting point. Excessive wear and deterioration owing to welding, overheating, formation of high resistance film and material transfer are some of the disadvantages associated with these contacts.

The National Physical Laboratory (NPL), New Delhi, has developed some silver-impregnated contacts for relays which combine the conducting properties of silver and refractory graphite and overcome the defects mentioned above. Such contacts are widely used in railway signalling relays. The special advantages of silver-impregnated graphite (SIG) material are its hard fusing characteristics, better conduction of heat and electricity, and easy brazing. Another feature of the process developed at NPL is that silver can be incorporated in any desired shape and in controlled quantity. The distribution of silver in graphite is uniform.

In the process of manufacture, graphite is shaped and its dimensions are checked. The cut pieces are washed, weighed and impregnated under va-

cuum. The pieces are finally washed and baked. After the samples are tested for mechanical and electrical properties they are ready for use.

The know-how has been transferred to Advance SIG Contacts, New Delhi, for commercial utilization. Presently, these contacts are imported and cost Rs 60 lakh in foreign exchange.

After vigorous tests and field trials, the Railways have found the material acceptable for their use.

RRL-Bhubaneswar to Help Improve Pig Iron Production of Kalinga Iron Works

The Regional Research Laboratory (RRL), Bhubaneswar, has collaborated with Kalinga Iron Works, Barbil, in setting up a pilot plant at Barbil for producing iron ore sinters. The plant with a capacity of 25-30 tonnes/day, is based on the technology developed by RRL on pan-sintering of iron ore fines. The plant will help utilize the waste ore fines and coke dust available with the firm.

The laboratory is also carrying out studies in the blast furnace on the effect of varying the percentage of sinters in the charge. These studies are expected to improve the economy and production of pig iron at the Kalinga Iron Works.

Rotor Induction Current Meter

The National Institute of Oceanography (NIO), Goa, has developed a current meter, which uses electric induction for sensing the rotation of the rotor. The rotation of the rotor is proportional to the magnitude of current. A light and thin ferrous-alloy piece mounted on the rotor produces signals in a coil, and these signals are amplified and fed to an electromagnetic counter for registering the rotation of the rotor. A gate circuit controls the time for which the pulses are passed to the counter. This time is decided to be such that the counts directly indicate the speed in centimeters per second. The instrument can measure current speed in the range 5-300 cm/sec with an accuracy of ± 1 cm/sec. It operates on 9 V dry

cells (self-contained) with a current consumption of 25 mA.

The current measurement is absolute and it is not necessary to align the instrument with the current direction. The sensor used in the instrument does not require any watertight chamber. The instrument is lighter than the conventional ones available at present.

Implementation of CECRI Technologies

Calcium Gluconate: Chem Kar P. Ltd, Karaikudi, have started trial production of calcium gluconate, a chemical widely used as drug for correcting calcium deficiency, utilizing the electrolytic process developed at the Central Electrochemical Research Institute (CECRI), Karaikudi. This firm, started under the scientist-entrepreneur scheme, is the eighth licensee of the process, and has an installed capacity to produce 200 kg of calcium gluconate per day.

Detinning of Tin Scraps: Chem Metals, Virudhunagar, Tamil Nadu, have started trial production of tin metal from tin scrap based on CECRI know-how. This firm is the seventh licensee of the process and has an installed capacity to process three tonnes of scraps per day.

Carbohydrate and Protein Complexes in Legumes

Miss N.S. Susheelamma of the Central Food Technological Research Institute, Mysore, has carried out studies on the carbohydrate and protein complexes in legumes with special reference to black gram (*Phaseolus mungo*). She has isolated, identified and resolved the mucilaginous principle(s), responsible for the soft and spongy texture of leavened foods made out of the legume, black gram, into a potent protein surfactant and a highly viscogenic polysaccharide (of the nature of an arabinogalactan) of high molecular weight. These two biopolymers occurring in the legume have been purified and characterized and their functionalities studied. The

two entities are not chemically associated but appear to function in a complementary way. The protein surfactant forms the foam and provides the spongy network, which is stabilized by the polysaccharide through the high viscosity it produces in aqueous dispersions, and thus prevents the collapse of the foam or its unique expansion and escape of gas held therein at the high temperatures attained during culinary operations. The postulate is supported by the fact that such texture could be generated by the combination of surface active protein and mucilaginous carbohydrate or gum from entirely different sources provided the proteins have adequate foam-forming capacity and the carbohydrate or gum is sufficiently viscogenic as compared with the black gram components. Proteins of groundnut, sesame and soybean along with guar gum on gelatinized soluble starch exemplify these principles.

Miss Susheelamma has been awarded Ph.D. degree of the Mysore University for her thesis based on these studies.

Chemical and Biochemical Studies on Toxicity of Silicates

Chronic occupational exposure to dusts of silicate minerals poses health hazards to the persons engaged in mining and processing of ores. As a part of a long-term programme to develop the know-how which is vital in developing diagnostic and curative measures, chemicals responsible for the toxic effects of dusts of asbestos, mica, talcum and china clay were studied by Shri Virendra Misra of the Industrial Toxicology Research Centre, Lucknow. Shri Misra worked under the guidance of Dr P.N. Viswanathan of the laboratory.

The presence of 3,4-benzo[a] pyrene (detected by gas-liquid chromatography, IR and UV spectroscopy and other methods) in Indian asbestos, its elution by nucleotides and the adsorption on, and catalytic decomposition by, asbestos fibres of DNA and RNA, indicated the carcinogenic potential of asbestos.

A study of the pulmonary biochemical response to asbestos dust in guinea pigs revealed involvement of biomembranes in the toxic processes. Also, the respiratory disturbances experienced by workers in this industry was found to be related to decreased carbonic anhydrase and altered serum chloride/bicarbonate ratio.

One of the factors responsible for the diverse biological effects of dusts of silica and silicates was found to be because of the interaction of silicic acid of the dusts with proteins, and possibly other membrane constituents. Protein-silicon interaction was characterized in detail with bovine serum albumin through kinetic studies, gel filtration and equilibrium dialysis. The findings lead to a clearer understanding of the mechanism of toxicity of silicates.

Shri Misra has been awarded Ph.D. degree in chemistry by the Gorakhpur University for his thesis based on this work.

NRDC-CSIR Processes

Out of the 740 processes and products ready for commercial utilization listed in the January 1978 issue of *NRDC Processes*, a six-monthly published by the National Research Development Corporation (NRDC) of India, 537 (nearly 72%) processes and products belong to the CSIR laboratories. Discipline-wise or area-wise break-up of the CSIR processes is as follows: Agro-based industry, 8 (out of 17); Chemical and allied industry, 82(99); Drugs and pharmaceuticals, 31(33); Dyes and dye intermediates, 12(12); Food industry, 22(25); Insecticides and pesticides, 17(19); Leather industry, 27(27); Marine chemicals, 9(9); Plastics, resins and paints, 23(34); Civil engineering, 39(40); Electrical industry, 26(32); Electronics industry, 45(71); Mechanical engineering, 34(60); Metallurgical processes, 35(38); Instruments and devices, 99(175); and Miscellaneous industries, 28(49).

Of the CSIR processes the highest number (83) of processes is offered by the National Chemical Laboratory,

Poona. The Central Electrochemical Research Institute, Karaikudi, comes next with 68 processes.

Deputation Briefs

Dr N.R. Ayyangar of the National Chemical Laboratory (NCL), Poona, who was deputed to the Federal Republic of Germany under the DAAD-CSIR Exchange of Scientists Programme, from 15 November 1977 to 15 February 1978, worked with the research group of Dr S. Hunig at the Institute of Organic Chemistry, Wuzburg University. Dr Ayyangar prepared cyclic addition products by reacting α -trimethylsilylacrylonitrile with 2,3,5,6-tetramethylbenzonitrile oxide and mesitylene nitrile oxide and characterized the products through NMR and IR spectra. He also gave a seminar lecture on 'Some reactions involving heterocyclic systems in dye chemistry'.

Dr Ayyangar visited a number of chemical firms, viz. E. Merck, Hoechst, Bayer and BASF. He attended a two-day seminar on high pressure liquid chromatography at Waters Associates in Konigstein.

PROGRESS REPORTS

VITM Annual Report: 1977

The annual report of the Visvesvaraya Industrial & Technological Museum (VITM), Bangalore, for 1977, brought out recently, shows that more than five lakh people, including school and college groups, visited the four galleries of the museum, viz. Motive Power, Electrotechnic, Timber and Paper, and Popular Science. The setting up of 'Copper', 'Gold' and 'Aluminium' sections of the 'Metals in Civilization' gallery was completed. The work on the 'Iron & Steel' section was in progress. The museum acquired during the year an M.G. locomotive from the Southern Railway, manufactured by Dubs & Co. (England) during 1884, and a prototype of HF-24 aircraft from the Hindustan Aeronautics Ltd.

VITM's two mobile science exhibition units, one with 'Popular science'

and the other with 'Planet we live in' exhibits visited 61 and 30 places respectively in Karnataka. The mobile unit with 'Water — the fountain of life' exhibits visited 76 places in Tamil Nadu.

A current awareness course on 'metal cutting' for industrial workers was organized in collaboration with the Institution of Engineers and Rotary Club (North), Bangalore. The course was attended by about 160 industrial workers in three batches.

An exhibition on cinematography, Cine Expo, was organized as part of the celebrations held to commemorate the 117th birth anniversary of Dr M. Visvesvaraya. The exhibition had the following sections: pre-moving pictures period, moving pictures period, the science and technology of contemporary cinema, and certain scientific and technological aspects of future cinema.

The museum conducted divisional-level science fairs in all the four educational divisions of Karnataka, viz. Belgaum, Gulbarga, Bangalore and Mysore. A state-level science fair was also organized with the district-level science fair prize-winners as participants. Two hundred thirty-five exhibits made by the students were displayed at the fair. Special demonstration-cum-training programmes were arranged for the participants on: clay moulds and casts making, food adulteration, and detection and identification of various minerals.

A summer hobby centre was organized for the students of Jawahar Bal Bhavan, Bangalore, on nature study, bird watching, physical science, aeromodelling and electronics. A new hobby centre on amateur telescope-making was started.

Two seminars on 'Role of technology in rural development' and 'Impact of discovery and invention on society' were held for school and college students. A science quiz and a number of popular lectures were also organized.

BTRA Annual Report: 1976-77

The Bombay Textile Research Association (BTRA), Bombay, has brought out its annual report (mimeographed)

for 1976-77. According to the report, the Association laid emphasis on solving the short-term problems and effecting cost economies of member mills. Seventy-one R&D projects, including surveys, were on hand during the period, and 15 of them were completed successfully.

Studies in spinning have shown that the appearance of mill yarn could be improved by one ASTM grade by resorting to frequent cleaning of certain parts in carding and effective elimination of disturbances in the settings and defective parts in combing. Use of separators, correct positioning of the sliver guides and replacement of slipped cot on the back rollers were found to be helpful in improving the performance of speed-frames and regularity of the material. Investigations relating to modifications of ring-frames revealed that the introduction of anti-vibration mounts, conversion to pulley drive and floor mounting of tin rollers could markedly improve the working and lead to significant reduction in end breaks and 5% increase in spindle speed and production.

BTRA's electrolytic process for reducing the consumption of hy-

drosulphite in vat dyeing was made available to non-member mills also. A demonstration model of this process was set up in Switzerland for necessary trials.

Efforts in weaving were aimed at improving the yarn preparation, quality of sizing and weavability of warps, leading to higher loom production with lower rejections due to defectives.

BTRA developed a suitable preventive disc for minimizing oily cots at gear-end and a suitable spindle oiling pump to put a predetermined quantity of spindle oil in the bolsters at the time of topping and pumping. Instruments developed earlier, viz. fibre bundle strength tester, BTRA 'PEP' unit for autoconer, digital stretch meter and flyer balancing apparatus underwent evaluation studies.

Studies in solvent swelling and deuterium exchange yielded important information on the fine structure of cotton.

A publication entitled 'Norms for Mechanical Processing', containing guidance on quality norms, maintenance aspects, stores consumption, and water, power and steam requirements, was brought out.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Tetradifon

Tetradifon is a modern acaricide and miticide, and is active on all stages of mite. The demand for Tetradifon together with other acaricides, viz. Dicofol and Ethion, is estimated at 150 tonnes by 1978-79. Tetradifon and Ethion are preferred for use on tea plantation. Tetradifon is not manufactured in the country and the entire demand is being met through imports.

The National Chemical Laboratory (NCL), Poona, has developed a process for the manufacture of Tetradifon with a view to making the country independent of imports of this important chemical. The process consists in treating trichlorobenzene (containing minimum 88% 1:2:4 isomer) with chloro-

sulphonic acid to obtain trichlorobenzene sulphonyl chloride which is then reacted with monochlorobenzene and aluminium chloride. The crude Tetradifon so produced is purified by crystallization. The process has been standardized on 1 kg per batch scale. The product obtained by this process matches, in respect of melting point, microanalysis and UV spectra, with the commercial sample.

Trichlorobenzene (containing minimum 88% 1:2:4 isomer), chlorosulphonic acid, sulphuric acid, aluminium chloride, chlorobenzene, ethyl alcohol and butyl acetate are the major raw materials required, and all these (of technical grade) are available indigenously. Mild steel (MS) reactor with

cooling coil, rubber-lined tank (MS), crystallizer (MS), centrifuge, drying oven, hydrochloric acid absorption and generating system, solvent recovery unit, sparkler filter and refrigeration system are the main items of plant and equipment. These are either indigenously available or can be fabricated in the country.

The capacity of an economically viable unit, according to NCL, is 30 tonnes per annum. The total capital outlay for a plant of this size is estimated at Rs 16.45 lakh (Rs 11.50 lakh on land, building, plant and equipment, and Rs 4.95 lakh as working capital). The ex-factory cost is estimated at Rs 54 per kg against C.I.F. price of Rs 70-90 per kg for technical quality product.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Luminescent Transfer Paper

Luminescent transfer paper finds application in confidential communication systems and in invisible signature verification systems. It is also used for confidential storage of information. Once the paper is made available indigenously and its uses become known, a good demand for this paper could be created in the country.

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for manufacturing luminescent transfer paper. The process consists in coating the paper with a solution containing a grease in an organic solvent and then with a saturated solution containing wax in a suitable solvent. It is further coated with a suspension of phosphors in a suitable organic liquid vehicle to which a small quantity of a suspension agent has been added. The paper is again coated first with a solution containing wax in order to enhance the protective character and then with solution containing a grease. The coated paper is dried and subjected to a mild pressure to ensure smoothness.

The process has been studied on a laboratory scale. About 100 sheets of

paper (30 x 20 cm²) have been prepared in the laboratory.

Paper sheet, grease, paraffin wax, phosphor and solvents are the main raw materials required, and all these are available indigenously.

Sprayer with compressor, drier, roller (calendering machine), cutter, glass apparatus, and UV lamps are the main items of plant and equipment. Excepting UV lamps, all are available indigenously.

The estimated total investment for setting up a plant capable of producing 100 sheets (30 x 20 cm²) per day is Rs 1.85 lakh (fixed capital on building and plant, Rs 0.815 lakh, and working capital, Rs 1.040 lakh). The cost of production is estimated at Rs 3.38 per sheet (30 x 20 cm²).

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Ethephon

Ethephon is an important plant growth regulator. By its application, rubber latex yields can be increased by 200 to 300%. Ethephon changes the female:male flower ratio and this eventually yields more fruits in many plants. It is also used for maturing and ripening of fruits in a number of plants, and is reported to increase yields of certain cereals. Ethephon is not known to be produced in the country. Also, its requirements in the country are not known precisely. Formulations of Ethephon, imported from Amchem of USA, are marketed under the brand name 'Ethrel' by Agromore Ltd, Bangalore. The requirements for latex stimulant formulations alone have been estimated at about 1.5 tonnes/annum by the Rubber Research Institute (RRI), Kottayam. The requirements of various plant growth regulators, as estimated by the Directorate of Plants Protection, Quarantine and Storage, is 100 tonnes for 1978-79.

The National Chemical Laboratory (NCL), Poona, has developed a process for the manufacture of Ethephon, with a

view to making the country independent of the imports of this important plant growth regulator. The process consists in (i) preparing tris-(2-chloroethyl) phosphite from phosphorus trichloride and ethylene oxide; (ii) isomerization of the phosphite to the diester of phosphonic acid; and (iii) de-esterification of the diester of phosphonic acid by dry hydrochloric acid gas to yield Ethephon.

The process has been standardized on 5 litres per batch scale. Yield of Ethephon is around 90% based on phosphorus trichloride. The product has been tested in the laboratory as latex stimulant by RRI, Kottayam, and has been found to be satisfactory. The Nimbkar Agricultural Research Institute, Phaltan, has also tested the product successfully for cucumbers and is carrying out experiments on some more plants.

Phosphorus trichloride, ethylene oxide, hydrochloric acid and sulphuric acid are the main raw materials required, and these are available indigenously.

Flasks, stirrers, distillation condensers, bubblers (all-glass), electrically heated oil baths or heating mantles with controls, and chilling unit are the major items of plant and equipment. All these are either available indigenously or can be fabricated.

The capital outlay for a plant of 6 tonnes/annum capacity (considered economical by NCL) has been estimated at Rs 2.46 lakh (Rs 1.00 lakh on all-glass equipment, Rs 0.50 lakh on land, and Rs 0.96 lakh as working capital). The cost of production is estimated at Rs 51.5 per kg against the C.I.F. price of Rs 200 per kg for the imported material. The selling price of 10% solution of Ethrel, used as latex stimulant, is Rs 105 per litre while that of 40% solution of Ethrel, used as plant growth regulator, is Rs 350 per litre.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Large Precision Pipette

The National Physical Laboratory (NPL), New Delhi, has designed and developed a pipette which can deliver 25 dm³ of water with an accuracy of 1 part in 10,000 and can be used for calibrating bigger capacity measures which are difficult to be calibrated, on account of their size, by gravimetric method.

The pipette consists of (i) a delivery tube and an inlet tube connected to a three-way stop-cock; (ii) a cylindrical body with two cones at ends; (iii) a threaded neck with a threaded adjusting cylinder, having a small bore and ending in a zero-setting tube with a similar bore; and (iv) an overflow cup fixed to the zero-setting tube. The adjusting cylinder can be raised or lowered by rotating to adjust the capacity of the pipette to the required value.

The stop-cock is turned so as to connect the inlet tube with the pipette. Water enters the pipette, rises slowly, till the pipette is full and excess water flows out through the zero-setting tube into the overflow cup. At that point the stop-cock is turned so that the connection is made between the pipette and the delivery tube. The water then flows out into the vessel to be calibrated, which is placed under the delivery tube.

The capacity of the pipette is initially adjusted and determined accurately by the gravimetric method. The adjusting cylinder enables precise adjustment of volume.

The main features of the pipette are:

1. The zero-setting and delivery of the entire volume of water are automatic and eliminate personal errors of the operator in reading the meniscus of water.
2. The adjusting cylinder is in a vertical position and has been combined with the zero-setting tube, not only to give an elegant look to the pipette but to ensure free upward and downward flow of water inside the pipette.
3. The adjusting cylinder has a capacity of about 200 cm³. Thus a variation of up to ± 100 cm³ in the nominal volume for the pipette

caused during manufacture can be adjusted to the desired value with a precision of 1 part in 10,000 in the case of a 25 dm³ pipette.

4. The filling from below, the inside shape of pipette, and the vertical adjusting cylinder, with bore expanding into a cone at the lower end, ensure air-free filling and eliminate errors due to entrapping of air.

The whole pipette is made of brass except the overflow cup which is made of glass. The outside surface of the pipette is plated with nickel.

CSIR SUPPORT TO RESEARCH

Computer-aided Analysis and Design of Reinforced Concrete Frames

In view of the increasing demand in recent years for reinforced concrete construction of multistorey buildings, work on a computer-aided analysis and design of reinforced concrete frames was undertaken by Shri H.N. Vijaya (a CSIR junior research fellow) at the Indian Institute of Technology (IIT), Madras. Shri Vijaya worked under the guidance of Dr C.S. Krishnamoorthy, Assistant Professor of Civil Engineering, at the institute.

Vijaya developed a computer programme, FRANMAX, to calculate the maximum positive and negative bending moments at critical sections in a multistorey frame due to various loading patterns under given factored load combinations. This programme, based on matrix displacement method, is general in application and can analyze the frame for (i) a single loading condition, (ii) a specified number of loading patterns, selecting the maximum positive and negative bending moments at each critical section, and (iii) critical loading pattern for each critical section automatically selected, computing the maximum positive and negative bending moments.

Ten practical multistorey frames were analyzed using FRANMAX and the loading patterns which gave the maximum positive and negative bending

The laboratory has fabricated two 25 dm³ capacity pipettes and supplied to Heavy Electricals (India) Ltd, Hardwar, and Central Water and Power Research Station, Poona. The performance of these pipettes has been found satisfactory.

The estimated cost of production per unit is Rs 2000.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

moment were studied. Vijaya suggested a few loading patterns which would be useful for designs. Five frames were analyzed for maximum effects, for suggested loading patterns and for all-span loaded conditions, and the results were compared.

Vijaya implemented a computer programme for the plastic deformation analysis using the linear programming technique. Three practical concrete frames were designed for maximum effects, and the collapse load factor for the suggested critical loading pattern for these frames was computed using the programme. Deformation analysis was conducted on a three-bay and two-storey frame and the inelastic rotations at collapse were compared with the allowable rotations reported by Baker.

Investigations were conducted on flexural rigidity of reinforced concrete members under ultimate load conditions. Using the modified EI (flexural rigidity) values, single-step elastic analysis was carried out for three single-bay single-storey frames. Three hypothetical multistorey frames were selected and elastic analysis was conducted using gross EI values and modified EI values.

Subroutines were developed for the computation of area of reinforcement for the design of columns and beams. Using the programme, columns can be designed for varying reinforcement ratios at the centre and the edges. Beams can be designed as rectangular section or as T-section and as singly or doubly

reinforced section. These routines were integrated with the analysis routines and the programme FRADPRO was developed for the analysis and design of reinforced concrete frames.

PERSONNEL NEWS

Appointments/Promotions

Promoted, consequent on assessment, at the Publications & Information Directorate, New Delhi, are: Shri G.B. Kale (as Scientist C; 23 July 1977); Miss L.V. Asolkar (as Scientist C; 12 Oct. 1977); Dr S.A.I. Rizvi (as Scientist C; 1 Nov. 1977); Shri A.K. Sen (as Scientist C; 1 Nov. 1977); Shri H.C. Jain (as Scientist C; 2 Nov. 1977); Shri D.S.R. Murthy (as Scientist C; 10 Nov. 1977); Shri J. Mahadevan (as Scientist C; 25 Nov. 1977); Shri Kuldip Chand (as Scientist B; 28 April 1977); Shri R. Doreswamy (as Scientist A; 22 Oct. 1976); Shri T. Banerjee (as Scientist A; 5 Dec. 1977); Shri J.B. Dhawan (as Scientist A; 12 Dec. 1977); and Dr V.K. Agarwal (as Scientist A; 18 Dec. 1977).

* * *

Appointed at the Regional Research Laboratory (RRL), Bhubaneswar, are: Dr A. Misra (Scientist C; 10 April 1978); and Shri K.K. Rao (Scientist B; 6 April 1978).

* * *

Promoted, consequent on assessment, at RRL, Bhubaneswar, are: Shri A. Suryanarayana (as Scientist C; 17 Aug. 1974); Dr H.O. Saxena (as Scientist C; 5 Aug. 1976); Dr Y.R. Rao (as Scientist C; 23 Aug. 1976); Dr S.C. Basa (as Scientist C; 25 Aug. 1976); Dr R.S. Thakur (as Scientist C; 8 Nov. 1976); Dr S.B. Kanungo (as Scientist C; 8 Nov. 1976); Dr J.R. Rao (as Scientist C; 8 Nov. 1976); Shri A.K. Jouhari (as Scientist C; 8 Nov. 1976); Shri J.R. Sahu (as Scientist C; 8 Nov. 1976); Shri S.C. Panda (as Scientist C; 29 Dec. 1976); Dr V.M. Pandey (as Scientist A; 30 Nov. 1976); Shri S.K. Debroy (as Scientist A; 8 Dec. 1976); Dr P.V.R.B. Sarma (as Scientist A; 21 Dec. 1976); Shri B.C. Mishra (as Scientist A; 22 Dec. 1976); and Shri T.R. Gupta (as Scientist A; 23 Dec. 1976).

Dr M. Bapuji and Shri S.K. Mandal of RRL, Bhubaneswar, have been promoted as Scientist B (27 Nov. 1977).

Dr C. Gopinathan of the National Chemical Laboratory (NCL), Poona, has been promoted from Scientist B to Scientist C (17 March 1978).

Dr (Mrs) R.D. Wakharkar has been appointed Scientist B at NCL, Poona (14 April 1978).

Honours

Dr M. Mahadevaiah, Shri W.E. Eipson, Smt. R.V. Gowramma and Dr L.V.L. Sastry, Scientists of the Central Food Technological Research Institute, Mysore, have been awarded the K.U. Patel Memorial Award for 1977 by the All India Food Preservers' Association for their research work on the development of indigenous tinsplate container for canning food products. The award was received by Dr M. Mahadevaiah at the annual conference of the Association held at Bombay recently.

Dr M. Mahadevaiah won this award last year also.

Obituary

Dr M.G. Krishna



Dr M.G. Krishna

It is with great regret that we record the sad and sudden demise of Dr M.G. Krishna, Director, Central Fuel Research Institute (CFRI), Dhanbad, Dr Krishna died of a heart attack on 5 June 1978 at his residence in Hyderabad.

Dr Krishna was the main guiding force in the planning, building and setting up of the Indian Institute of Petroleum (IIP) and its laboratories. IIP was set up at a time when the public sector had just made an entry in the oil refining and marketing areas. It is largely due to the drive, enthusiasm and the able guidance of Dr Krishna that the institute became *de facto* technical con-

sultant to the Ministry of Petroleum & Chemicals as also the petroleum industry.

Dr Krishna was a member of the following government committees in the petroleum sector: Committee on Additional Refining Capacity in Assam; Ganga Pollution Committee; and Fuel Policy Committee.

In 1969, Dr Krishna was made Chairman of Lubrizol India Ltd, a joint venture of Lubrizol (International) and the Government of India for the manufacture of additives for petroleum products. He continued in this capacity till the end and played a vital role in the growth of this company.

Dr Krishna was, for some years, on the board of directors of Lube India Ltd. Currently, he was on the boards of Fertilizer Corporation of India and Engineers India Ltd.

Dr Krishna (born 18 July 1922) obtained his B.Sc. (Hons) in chemical engineering (1942) and M.Sc. in technology of fine chemicals (1944) from Andhra University and Ph.D. in chemical engineering (1948) from the University of Leeds. He joined, in 1944, the Chemical Laboratories of the Council of Scientific & Industrial Research. Appointed as Scientific Officer in the Regional Research laboratory (RRL), Hyderabad, in 1950 Dr Krishna became its Assistant Director in 1955 and headed the Coal Division. Dr Krishna joined IIP in 1962 as its Deputy Director soon after the creation of the institute. He became Director of IIP in 1964 and continued there till he took over as Director of CFRI in June 1974.

Dr Krishna's researches were wide-ranging, covering as they did coal, petroleum, natural gas and their products; chemicals; and economic utilization of hydrocarbon sources. He had about 60 research/review papers and six patents to his credit.

Dr Krishna was associated with a number of Indian delegations to Australia, Austria, East Germany, Finland, France, Holland, Iran, Mexico, UK, USA, USSR and West

Germany. He was a fellow of the Indian Institute of Chemical Engineers and of Andhra Pradesh Academy of Science, and a member of the International Combustion Institute.

National Design Engineering Conference

A National Design Engineering Conference is being organized during December 1978 jointly by the Indian Institute of Technology, Madras; Institution of Engineers (India) — Tamil Nadu Centre; and the Association of Indian Engineering Industry (Southern Region). Co-sponsored by the Department of Science and Technology, Ministry of Defence (R & D Organisation), Council of Scientific & Industrial Research, and several leading industrial establishments, the conference will be spread over four technical sessions devoted to (i) Importance of design engineering; (ii) Status report; (iii) Design information; and (iv) Future trends. The topics to be discussed at the conference are: contribution of design to engineering progress; difference between design science and exact sciences; place of design in the industry in both industrialized and industrializing countries; facts and figures relating to design work being carried out by individuals and groups; design methods employed at present; available capacities and capabilities; difficulties faced in design work; training of designers and draughtsmen; case studies; interaction between design, production, maintenance, operation, testing, packaging, environment, etc.; methodology of design; new developments such as CAD, CAM, and GT; design management; standardization; design for rural industries; and future manpower needs.

The last date for receiving the full papers along with abstracts is 15 August 1978. Further details can be had from Dr K. Lakshminarayana, Mechanical Engineering Department, Indian Institute of Technology, Madras 600036.

CSIR SCIENTIFIC PERIODICALS

JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH (monthly)

With a fine record of over 35 years' service to the scientific community, this journal has grown into India's leading general science periodical. Intended to fulfil the responsibility of helping the research workers to keep themselves abreast of current developments in various fields of science and technology, the journal carries editorial features highlighting important scientific events in India and abroad; articles on science policy and management of science; review articles on topics of current research interest; technical reports on international and national conferences; reviews of scientific and technical publications; and notes on major advances in various fields.

	Rs	£	\$
Annual sub- scription	60.00	10.00	25.00
Single copy	6.00	1.00	2.50

INDIAN JOURNAL OF CHEMISTRY (monthly)

*Section A: In the 15th year of publication, the journal is devoted to papers in inorganic, physical, theoretical and analytical chemistry.

*Section B: In the 15th year of publication, the journal is devoted to papers in organic chemistry including medicinal chemistry.

	Rs	£	\$
*Annual sub- scription	70.00	12.00	30.00
Single copy	7.00	1.20	3.00

INDIAN JOURNAL OF PURE & APPLIED PHYSICS (monthly)

The journal, which is running 15th year of its publication, is devoted to original research communications (full papers and short communications) in all conventional branches of physics (except radio and space physics).

	Rs	£	\$
Annual sub- scription	100.00	16.50	42.00
Single copy	10.00	1.80	4.50

INDIAN JOURNAL OF RADIO & SPACE PHYSICS (bimonthly)

This journal, which is being published beginning from March 1972, is intended to serve as a medium for the publication of the growing research output in various areas of radio and space physics, such as ionospheric propagation, magnetosphere, radio and radar astronomy, physics and chemistry of the ionosphere; neutral atmosphere; airglow, winds and motion in the upper atmosphere; stratosphere-mesosphere coupling; ionosphere-magnetosphere coupling; solar-terrestrial relationship, etc.

	Rs	£	\$
Annual sub- scription	60.00	10.00	25.00
Single copy	12.00	2.00	5.00

INDIAN JOURNAL OF TECHNOLOGY (INCLUDING ENGINEERING) (monthly)

This journal publishes papers reporting results of original research of applied nature pertaining to unit operations, heat and mass transfer, products, processes, instruments and appliances, etc.

	Rs	£	\$
Annual sub- scription	60.00	10.00	25.00
Single copy	6.00	1.00	2.50

INDIAN JOURNAL OF EXPERIMENTAL BIOLOGY (monthly)

This journal, devoted to the publication of research communications in the fields of experimental botany, zoology, microbiology, pharmacology, endocrinology, nutrition, etc., is the only one in India with such a wide coverage and scope.

	Rs	£	\$
Annual sub- scription	120.00	20.00	50.00
Single copy	12.00	2.00	5.00

INDIAN JOURNAL OF BIOCHEMISTRY & BIOPHYSICS (bimonthly)

This journal, published in association with the Society of Biological Chemists (India), Bangalore, is the only research journal in India devoted exclusively to

original research communications in biochemistry and biophysics.

	Rs	£	\$
Annual sub- scription	40.00	7.00	17.00
Single copy	8.00	1.40	3.50

INDIAN JOURNAL OF MARINE SCIENCES (quarterly)

Commencing publication from June 1972, this journal is devoted to research communications (full papers and short communications) pertaining to various facets of marine research, viz. biological, physical, geological and chemical oceanography.

	Rs	£	\$
Annual sub- scription	40.00	7.00	17.00
Single copy	12.00	2.00	5.00

RESEARCH AND INDUSTRY (quarterly)

Intended to serve as a link between science and industry, this journal is addressed primarily to technologists, engineers, executives and others in industry and trade. It publishes informative original articles containing practical details of processes and products developed in India, which show promise of ready utilization, and technical digests on new processes, products, instruments and testing methods which are of interest to industry. Developments in Indian industry are regularly reported.

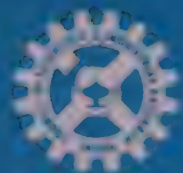
	Rs	£	\$
Annual sub- scription	24.00	4.00	10.00
Single copy	7.25	1.30	3.50

INDIAN JOURNAL OF TEXTILE RESEARCH (quarterly)

Commencing publication from March 1976, this journal is devoted to the publication of papers reporting results of fundamental and applied researches in the field of textiles.

	Rs	£	\$
Annual sub- scription	36.00	6.00	15.00
Single copy	12.00	2.00	5.00

Please contact: The Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012



CSIR NEWS

VOL 28 NO 13 15 JULY 1978

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Introduction of Ergotoxine Strain of Ergot in India

Ergot alkaloids have a broad spectrum of biological activity and are widely used in modern medicine throughout the world for treatment of a number of diseases. These alkaloids are obtained from ergot of rye, the trade name for the sclerotia of the fungus *Claviceps purpurea* (Fr.) Tulasne which is parasitic on rye (*Secale cereale* Linn.). Till about twelve years ago, the drug was imported from Europe. The Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, in collaboration with the Regional Research Laboratory (RRL), Jammu, developed indigenous agro-technology for the cultivation of ergot. As a result, ergot of rye is being produced by CIMPO at its farms in Jammu & Kashmir since 1966-67. The country has now become self-sufficient

in this drug and its import has been stopped.

Hitherto, the strain of ergot produced in the country was primarily meant for production of ergotamine—an alkaloid specific for treatment of migraine. Recently, the ergotoxine group of alkaloids, which consists of ergocristine, ergocryptine and ergocornine, have been found to possess novel and specific biological activity and for this reason they are used extensively for the treatment of certain diseases. A formulation of these alkaloids under the trade name 'Hydergine' has been found to be effective for vaso-relaxation, increased blood flow and systemic lowering of blood pressure. At the specific request of the Indian pharmaceutical industry for this particular strain of ergot, an attempt was made by CIMPO to introduce ergotoxine-specific strain in India. The strain, obtained through Indo-German Alkaloids, Bombay, has been further improved upon for commercial production.

Pilot-scale cultivation of the improved strain at CIMPO research-cum-demonstration farm, Kukrail (Lucknow), has shown that it can be successfully cultivated with 0.725 % total alkaloids and 0.4 % ergotoxine. The average yield of ergot sclerotia is 100 kg/ha. The parent strain introduced from Europe had only 0.3 % total alkaloids. This strain has been cultivated on a commercial scale by CIMPO at its farms in Kashmir valley and about five tonnes of ergot are estimated to be produced during the current year. The yield is expected to be

much higher in the temperate climate of Kashmir.

Production of Diosgenin

RRL-Jammu Transfers Technology on Turn-Key Basis

The Directorate of Cinchona and Other Medicinal Plants of the West Bengal Government at Mongpoo (Darjeeling Dist.) has assigned a turn-key job to the Regional Research Laboratory (RRL), Jammu, to set up a commercial plant (capacity, 1500 kg of raw material per batch) for the production of diosgenin. The contract, worth Rs 7.5 lakh, includes plant design, fabrication of chemical process equipment, procurement of standard items, and installations and commissioning of the plant at site in Darjeeling.

The laboratory has already established three plants for the production of diosgenin. The plants are located one each in Haryana (Beal Products, Bahadurgarh), Himachal Pradesh (Nayar Minerals Export Ltd, Damtal) and Punjab (Ganga Ram Suraj Parkash, Jullundur). These firms have collectively produced diosgenin worth about Rs 40 million so far.

The present plant is expected to be ready in a month for pre-shipment trials, and will be in regular production before the end of 1978. A special feature of the plant is the introduction of the latest technique of heat transfer — limpet coils instead of conventional jacket — as a result of which there is appreciable increase in the heat transfer coefficient, and consequent economy. The plant conforms to the standard design and fabrication practice in accordance with IS/TEMA code requirement.



Ergotoxine strain of ergot showing characteristic long and thin sclerotia

Diosgenin, which is produced from diosgenin-bearing plant material, is a steroidal sapogenin used as an intermediate in the manufacture of oral contraceptives, sex hormones and corticosteroids.

NCL Processes Transferred to Industry

Two processes, viz. (i) manufacture of Bisphenol-A, and (ii) manufacture of theophylline, aminophylline and caffeine, developed at the National Chemical Laboratory (NCL), Poona, have been transferred to industry through the National Research Development Corporation of India.

The process for the manufacture of Bisphenol-A has been released to a party in New Delhi. Bisphenol-A is widely used as an intermediate in the manufacture of epoxy resins and polycarbonates, which in turn find applications in the production of surface coatings, structural plastics and adhesives. At present the chemical is being manufactured by a few firms on a small scale.

The process for the manufacture of theophylline, aminophylline and caffeine has been released to a party in Bombay. The licensee has been issued a letter of intent to manufacture 60 tonnes of theophylline and aminophylline each and 40 tonnes of caffeine. Theophylline is used as a myocardial stimulant, diuretic and as a drug for bronchial asthma. Aminophylline, a derivative of theophylline, has the same uses. Caffeine is widely used as a stimulant to the nervous system and as a diuretic. It is also an ingredient of some beverages.

Potassium Silicate Process Goes into Production

Electrochem Enterprises, New Delhi, commissioned their potassium silicate plant on 7 February 1978. The plant, first of its kind in India, is situated at Gurgaon Industrial Belt, Haryana, and has an installed capacity of 50 tonnes/annum.

The process know-how for potassium silicate solution (electronic grade), developed by the Regional Research

Laboratory (RRL), Jorhat, was transferred to the firm in 1975. Concerted efforts by the firm and RRL, Jorhat, led to the commercialization of the process within a period of two years. Samples of the product manufactured by the firm have been found acceptable to users.

Electronic-grade potassium silicate solution finds extensive application in

the manufacture of television tubes and screens, cathode ray tubes, etc. At present, high-purity potassium silicate solution is not manufactured in the country and the demand for this chemical is met through import. On regular production, the unit is expected to meet the requirement of potassium silicate solution in the country to a great extent.

The Changing Atmosphere — Future Trends and Consequences, and Options for India

Dr A.P. Mitra's Proposed Work under Jawaharlal Nehru Fellowship

Dr A.P. Mitra, head of the Radio Science Division, National Physical Laboratory, New Delhi, has been selected for Jawaharlal Nehru Fellowship for a period of two years. Following is a brief account of Dr Mitra's proposed work under the fellowship:

Major changes are occurring in the atmosphere, not merely at or near the ground but at higher levels, including the stratosphere and mesosphere, and some of these may be irreversible. Both natural and manmade effects occur; and the effects could be short-term as well as long-term ones. It is important to examine these changes in quantitative terms taking the lower and the middle atmosphere as a whole, to have a look at the evolution of this atmosphere from past records, and to predict its future trend.

Amongst the several sources that contribute to the changing atmosphere, Dr Mitra will be concerned primarily with the following: (i) the gradual increase of global CO₂ and aerosol concentrations at tropospheric heights and their consequences; (ii) future trends on changes in ozone at stratospheric levels owing to the impact of solar particles following solar flares, to injection of nitric oxide and chlorine from supersonic aircrafts, industrial fluorochloromethanes, volcanic eruptions and increasing use of nitrogenous fertilizers; prediction of such changes, and an estimate of the consequences of these changes; (iii) changes in atomic oxygen and nitric oxide at mesospheric levels and the coupling between tropo-

spheric, stratospheric and mesospheric levels.

In the troposphere the pollutants have a relatively short time, but once these pollutants enter the low-temperature trap of the stratosphere, they may remain there for years, and hence large-scale injections of such materials even at long-time intervals can have cumulative effects. An example of such injection is the volcanic eruption. Another is the injection of solar particles following flares.

Major volcanic eruptions are now occurring at the rate of about one in two years. These inject sulphur dioxide and chlorine right into the stratosphere. These would have two kinds of effects: depletion of the stratospheric ozone by the injected chlorine, and consequent warming up of the atmosphere from the 'green house' effect. The major question here is whether the atmosphere ever recovers entirely after every injection of volcanic materials into the stratosphere. This involves a thorough look at stratospheric chemistry in a dynamical frame.

The increasing concentration of carbon dioxide as a result of increasing use of fossil fuel and the large-scale burning of wood in the villages needs to be quantitatively examined and corrective action taken. As opined by a Soviet academician recently, the practice of burning wood over centuries may have eventually injected a large blanket of minute particles into the stratosphere. If the subsidence time is indeed large at these heights, a gradual

change in the climatic conditions should have taken place.

There are also evidences to show that the changes in the troposphere, stratosphere and mesosphere are not unrelated. Consequently, an examination of the future trend in the changing atmosphere must not be limited to tropospheric heights only. Dr Mitra will try to examine three representative levels at 5, 20 and 80 km of height.

An estimate of the future trend in the changes of many of these minor constituents would require the use of atmospheric chemistry of heterogeneous and non-heterogeneous type, which is essentially an extension of much that has been used by Mitra's group earlier for higher levels. The main thrust would be in terms of chemical-radiative modelling and the use of aerosol chemistry.

The work will involve the following steps: (i) examination of the evolution of the atmosphere from past records; (ii) prediction of the future trend of changes in some of the major and minor constituents of the atmosphere (e.g. CO_2 , O_3 , H_2O , NO , O); (iii) determination of the consequences of such changes; and (iv) identification of the options available for India.

The work is expected to lead to specific recommendations concerning the stand that India should take in relation to the ozone depletion problem in the international forums (such as the UN Committee on Environmental Protection), or in connection with the conflicting requirements of nitrogenous fertilizers (which may also deplete ozone), or in relation to the alarming increase of carbon dioxide and aerosol at tropospheric levels.

Cation Distribution in

Spinel-Type Compounds

Studies on the cation oxidation states of iron and its site distribution in mixed oxides spinels FeV_2O_4 and FeCoCrO_4 and the chemical effect brought about by electron capture decay of ^{57}Co in CoAl_2O_4 were carried out by Mössbauer spectroscopy and X-ray

intensity diffraction by Shri M.P. Gupta of the National Chemical Laboratory, Poona. Shri Gupta worked under the guidance of Dr A.P.B. Sinha of the laboratory.

The spinels were prepared by the usual ceramic technique. The compound formation was verified by X-ray method. In the case of FeV_2O_4 the room-temperature and 193°K Mössbauer spectra were resolved into two pairs of quadrupole split spectra with the inner pair having isomer shift of 1.02 ± 0.05 mm/s and quadrupole splitting of 0.43 ± 0.10 mm/s, and the other pair having isomer shift of 1.13 ± 0.05 mm/s and quadrupole splitting of 2.24 ± 0.10 mm/s. From the experimental results the inner pair was attributed to Fe^{2+} ion in the tetrahedral site and the outer pair to Fe^{2+} ion at the octahedral site. The suggested cation distribution is $\text{Fe}_{1-x}\text{V}_x[\text{Fe}_x\text{V}_{2-x}]\text{O}_4$, where the degree of inversion $x/1-x$ was determined from the relative areas under the sub-spectra to be 10%. This value was in agreement with that (8.7%) determined by X-ray intensity measurement.

The Mössbauer spectra of FeCoCrO_4 were taken in the temperature region of $4.2\text{--}538^\circ\text{K}$. From the results it was concluded that Fe^{3+} ion is situated both at tetrahedral (A) and octahedral (B) sites in equal quantity. The transition from magnetic to paramagnetic state was found to take place at $315 \pm 5^\circ\text{K}$. The effective magnetic field was found to be 500 ± 5 kOe for both A and B sites at 0°K .

Shri Gupta studied the chemical effect brought about by the decay of ^{57}Co in CoAl_2O_4 by doping it with ^{57}Co and using it as a source against stainless steel absorber. The Mössbauer spectra were recorded at 193° , 298° and 547°K . The spectra were found to exhibit Fe^{2+} , Fe^{3+} and Fe^{4+} states. From the analysis of the Mössbauer spectra it was shown that both A and B sites in the spinel contained Fe^{2+} and Fe^{3+} states of iron. The Fe^{4+} and Fe^{3+} states were found to be temperature-dependent and the Fe^{2+} state temperature-independent.

Shri Gupta has been awarded Ph.D. degree (chemistry) of the University of Poona for his thesis based on these studies.

Foundation Day Lecture :

RRL, Jorhat

The fourth foundation day lecture of the Regional Research Laboratory (RRL), Jorhat, was delivered by Dr Cyril Ponnampuruma, Professor, Department of Chemistry and Director, Laboratory of Chemical Evolution, University of Maryland, USA, on 1 April 1978. Speaking on 'Origin of life in the universe', Prof. Ponnampuruma dwelt on the chemical evolution of life starting from the early reports of Charles Darwin to the present biological experiments carried out in Mars by the Viking mission. The lecture was illustrated with slides relating to the experiments carried out in his laboratory.

PROGRESS REPORTS

NAL Annual Report: 1976-77

The annual report of the National Aeronautical Laboratory (NAL), Bangalore, for 1976-77, brought out recently, shows that the laboratory's programme of work in aerospace and allied fields has resulted in considerable capability. The increasing efforts of the laboratory in hardware development in response to the aerospace needs of the user organizations has resulted in a marked increase in the number of sponsored or grant-in-aid projects by various agencies. During the year, the laboratory investigated 84 research projects with the support of agencies like Department of Space, Ministry of Defence, Hindustan Aeronautics Ltd and other public/private sector undertakings.

In aerodynamics, NAL's work related to contemporary aircraft design and development of special techniques in the 4-ft tunnel to serve more effectively the immediate needs of the aerospace industry. The 4-ft wind tunnel was used, as in the previous years, in wind tunnel testing work for various organizations. During the year, 547 blowdowns were conducted in the 4-ft

tunnel and 1810 blowdowns in the 1-ft tunnel. Of the various tests conducted in the 4-ft tunnel, the stage separation studies for the Indian Space Research Organization (ISRO) and external stores studies deserve special mention. To facilitate measurements of forces on external stores, special miniature strain gauge balances were designed and fabricated in the laboratory.

The major thrust in the R&D activities in the area of propulsion was on the establishment of turbomachinery and combustion laboratory with UNDP assistance. Work on the design, fabrication and installation of the transonic cascade tunnel, compressor research rig, and vibrations laboratory was under progress. The turbine research rig, gas dynamics and combustion laboratory, and subsonic cascade tunnel were operational and research projects were undertaken in these laboratories.

A computer programme was developed for the calculation of steady-state temperature distribution in turbomachinery components using a finite element technique. This type of analysis greatly facilitates solutions of thermal structural problems through easy interchange of data and is useful for the design of components having a high degree of mechanical and thermal stresses such as gas turbines, discs and blades.

A laser holography system comprising a 50 mW He-Ne laser and associated optical elements was assembled and commissioned.

Work was completed on the design, development, fabrication and commissioning of an electro-hydraulically controlled, large vertical filament winding machine for fabricating FRP pressure vessels. This machine, developed under the sponsorship of Aeronautics Research & Development Board (ARDB), is capable of fabricating shells of up to 1.5 m in diam. and 4.2 m in length.

Feasibility studies on electrochemical machining (ECM) of fir tree root shapes for steam turbine blades were concluded

successfully. The fir tree roots produced by ECM technique possess smooth surface finish, and pitting is absent.

A special plating bath was developed for gold plating stainless steel push rods to the extent of 5 μ thickness followed by a 5 μ copper coating.

A high-silica fibre (NALSIL) (silica content, 98-99%) was produced in the laboratory. The fibre is suitable for furnace insulation and can be used in the manufacture of rocket nozzles.

A new, inexpensive bath for tin-plating by electroless and electrolytic methods was developed.

An advanced version of manual multipoint apparatus (MAMPA) for vibration testing was designed, developed and fabricated to satisfy the various input/output requirements of multi-point excitation technique. This system is useful for the ground resonance testing of complex flight structures.

A motion-based research simulator was developed and commissioned. The facility serves as the design tool for the flight control system design and also provides crew training with the incidental saving in fuel, and helps in reducing the risk of accidents.

An electronic weighing system with a range of 0-30 tonnes for weighing transport vehicles was designed, developed and fabricated for Narne Tulaman, Hyderabad; the system has been installed at their factory.

A twin type velocity pickup was designed for the measurements of both horizontal and vertical vibration caused by rotating imbalance in turbogene-

rators. This pickup has a sensitivity of 300 mV/cm/sec and a frequency response from 9 to 300 Hz. It would be used in turbosurvey equipment associated with 20 MW turbogenerators manufactured by the Bharat Heavy Electricals Ltd (BHEL), Hardwar.

On behalf of ARDB, the laboratory has successfully designed, developed and commissioned a heavy-duty spark erosion machine. This machine comprises a 50 A 60 V generator and an electrohydraulic tool feed system and could be used for making forging dies.

Work was completed successfully on the digital data bus for aerospace applications and the microprocessor based data logging system.

A low-cost micro-computer with associated software package was developed. Based on the latest LSI technology, the system can be employed in data logging, laboratory automation, numerical control, process control, etc.

Twenty-nine research papers were published and 77 papers were presented at symposia/conferences. Three patent applications were filed. Three processes were released to industry, bringing the total number of processes released so far to 20, of which 15 have been utilized for commercial production.

The total receipts of the laboratory during the year were Rs 11.05 million, of which a sum of Rs 5.30 million came from analytical and testing charges, royalties/premia, 4-ft tunnel operation charges, sale of pilot plant products, etc. The total financial inputs of the laboratory, including contractual R & D, amounted to Rs 37.79 million.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Ophthalmometer

This optical instrument is used for the measurement of radii of curvature of the interior surface of cornea, its refractive power, the positions of the two principal meridians of an astigmatic cornea, and corneal refractive power in each of the two principal meridians. These parameters are important for prescribing contact lenses and for supplement-

ing retinoscopic findings. The instrument is, therefore, useful in ophthalmological research centres, eye hospitals, optical clinics, etc.

The Central Scientific Instruments Organisation, Chandigarh, has developed an ophthalmometer, which consists of a telescopic system for focussing the catoptric images of the two test figures, and a doubling prism

placed in a carrier along the optical axis of the system so that its linear movement can be calibrated in radii of curvature and refractive power. The optical system is rotatable about its axis to enable measurement of the two meridians for astigmatic errors. The whole system is placed on a well-designed easily-adjustable base, which can be raised or lowered with respect to chin and head rest.

The principle employed in the instrument is that the surface of the cornea acts as a convex mirror and the size of the image varies with its curvature. The size of the two targets in the form of cross lines in the instrument is constant, and the separation between the four images is altered by moving the doubling prism along the optical axis of the telescopic system. The doubling of images dispenses with the necessity of immobilizing the living eye.

The manufacture of the instrument involves fabrication and assembly of different optical and mechanical parts and performance evaluation tests. The laboratory has fabricated a prototype of the instrument. The performance evaluation tests on the prototype conducted at the Post-Graduate Institute of Medical Education and Research, Chandigarh, on 30 patients have yielded results comparable to those of an equivalent imported instrument.

The specifications of the instrument are as follows:

Radii of corneal curvature range	: 5.5-11 mm
Refractive power range of cornea	: 30.5-60.5 D
Least count of circular scale for meridian measurement	: 2°
Radii of curvature scale—interval graduations	: 0.1 mm
Refractive power scale—interval graduations	: 0.5 D

The present estimated demand for the instrument is about 10 pieces per annum and this is being met entirely through imports. There is likelihood of a three-fold increase in the demand in the next five years.

The main raw materials required are aluminium, brass, mild steel, and optical

glass. All these are available indigenously.

It is suggested that the instrument could be taken up for manufacture as an additional item by those firms which are engaged in manufacture of opto-medical instruments, as no extra capital will then be required for equipment.

Taking a batch production of 10 pieces of the instrument in one lot, with proper quality control, it is estimated that the total shop-floor cost inclusive of raw materials, fabrication, assembly and testing would not exceed Rs 4000 per piece. The selling price of an equivalent imported instrument is about Rs 10,000 per piece.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Wax Emulsion

Extending the storage life of easily perishable fruits and vegetables is important for a tropical country like India. One method of extending the storage life is to apply wax emulsion to the fresh produce. The emulsion protects fruits and vegetables against excessive moisture loss, higher respiration rate, heat buildup and thermal decomposition. As a result the texture and quality of the produce are maintained for a longer period. However, the wax emulsion without the use of fungicide in the required concentration cannot protect fruits and vegetables against microbial spoilage. Therefore, fungicides have to be incorporated into the diluted or undiluted wax emulsion before application.

The Central Food Technological Research Institute (CFTRI), Mysore, has developed a process for making a wax emulsion of oil-in-water (O/W) type containing 12% of solids. The emulsion coating is invisible to the naked eye; does not interfere with the natural appearance, colour, flavour and quality of fruits and vegetables; reduces moisture loss and helps fruits and vegetables retain their external texture;

extends the storage life of fruits and vegetables by 50-100% at ambient and low temperatures; is economical and non-hazardous; imparts shine and gloss to the commodity; and protects the fruits and vegetables from organisms causing fungal decay when proper fungicides are used in the required concentration in the emulsion.

In the CFTRI process, the waxes are weighed, melted and the necessary quantity of emulsifiers added at controlled temperatures. Boiling water is then added until the O/W type wax emulsion is formed. The hot wax emulsion is cooled by running cold water and the volume of the wax emulsion is made up with cold soft water. The cooled wax emulsion is dispensed into containers and stored at room temperature. The wax emulsion is stable and does not deteriorate between 10° and 100°C for a period of 9-12 months. Once frozen the water wax emulsion cannot be thawed.

While preparing the emulsion the following specifications are to be met: the concentrated wax emulsion with 12% solids should not precipitate out even when diluted with 0.5% of soft cold water; on removal of water from the wax emulsion in an oven at 80°C the solids should register not less than 12% and not more than 13%; the viscosity of the product should be 5.5-6 cps and pH, 9.0-9.4.

The laboratory has prepared the wax emulsion on a pilot plant with a capacity of 20-25 gal./day (12 hr) and has supplied more than 1000 gal. of the emulsion to several parties.

Investigations on the use of the wax emulsion developed at CFTRI have been carried out extensively in India and the results published. The commercial application of the wax emulsion to mandarin oranges of Coorg and Nagpur is already established. The fruits and vegetables with or without wax coating have been compared from the point of view of marketability and quality. The waxed fruits fetch better returns and are acceptable in taste and flavour. The annual demand for the emulsion is likely

to be 20,000 gal. when only 20% of the citrus fruits like oranges are waxed.

The following raw materials are required for the manufacture of the wax emulsion: sugarcane wax, carnauba wax, paraffin wax, oleic acid, triethanolamine, shellac, ammonia, refined Ravalgaon. All the ingredients are available indigenously.

The machinery and equipment required are: wax emulsion unit with stirrer, motor, speed adjuster, jacketed SS round-bottomed tank, MS tank, valves, pump, exhaust fan, and burners. All these can be procured or got fabricated indigenously. The room where the material is being produced should be provided with an exhaust fan, a fire extinguisher, ventilators, etc. A first-aid box should also be kept handy.

The suggested capacity of an economic unit is 100 gal. per day (12 hr operation). For such a unit a land of 100 m² area with a building of 40 m² area and a total investment of Rs 1,57,000 (comprising Rs 22,500 for plant and machinery, and Rs 1,34,500 as working capital) would be required.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS ACCEPTED

Indian Pat. 1311/Cal/76

Rotary photoprint washer

D.D. Chakravarty, P.N. Phukan & D.K. Dutta
Regional Research Laboratory, Jorhat

In photographic processing the excess fixing salts present on the photoprints are to be washed out from the prints after development and fixation. Washing is done by manually shaking the fixed prints thoroughly in running water. This is a laborious process and requires constant attention. In large-scale production of photoprints, however, rotary photoprint washers driven by electric motors are used sometimes. Such washers are quite expensive because of the use of electric motor and gear box, and require electric power for operation. The Regional

Research Laboratory, Jorhat, has developed a rotary washer driven by a jet of water. The unit needs a source, such as a tap or an overhead tank, that can deliver water with pressure. The jet of water collected in the tank is also used to wash the prints.

The equipment does not require any electric power for operation and can, therefore, be conveniently used in places where there is no power supply. The unit can be easily fabricated at fraction of the cost of an electrically operated one, and will, therefore, be within the reach of smaller photo studios. It is possible to wash a good number of prints at a time and the washings are uniform, a property which is very much essential for obtaining good quality prints. The unit requires minimum human attention during operation, as the washing of prints is done automatically.

Indian Pat. 2170/Cal/75

An improved process for manufacture of a pancreatin product used for bating hides and skins in leather manufacture and for stripping gelatin from photographic and X-ray films

S.C. Dhar, S.M. Bose and K. Lakshmibarathi
Central Leather Research Institute, Madras

The enzyme bate is one of the essential auxiliaries for leather processing. The exact quantity of bates required by the Indian leather industry is not known. However, considering the availability of raw hides and skins in the country and their corresponding pelt weight, it has been estimated that about 1500 tonnes of bating agents, excluding the enzymic dehairing agents, would be required in 1978-79. At present, the requirements of the industry for bates are met partially (30-40%) by products of indigenous manufactures and the rest by imports.

With a view to aiding indigenous manufacture of highly potent enzyme bates, the Central Leather Research Institute (CLRI), Madras, has developed a process for the manufacture of a pancreatin product. In the process, well-minced animal pancreas is subjected to two suitable sequential treatments for the complete conversion of the inactive enzyme precursors to highly active enzyme proper and then blended

with cheap, indigenously available carriers of enzymes and ammonium salts, dried and powdered for the manufacture of pancreatin product. The process for the manufacture of pancreatin product is simple and economical.

The pancreatin product is useful for the manufacture of several tailor-made products to suit the needs of bating different types of hides and skins for processing to various end-products. The CLRI pancreatin product is capable of replacing imported pancreatin, which is used for the recovery of both silver and cellulose triacetate base from exposed photographic and X-ray films.

A pre-design cost estimate for the production of pancreatin product has been prepared. An investment of Rs 60,000 for plant and equipment can yield 33% return with the production of 250 kg of bate per day per shift. All the machines and raw materials are available indigenously and it is easy to maintain the day-to-day production of standard-quality bate.

Indian Pat. 116/Cal/75

Improvements in or relating to preparation of pigment-grade calcium chromate

S. Guruviah, M. Sundaram, V. Chandrasekharan & K.S. Rajagopalan
Central Electrochemical Research Institute, Karaikudi

Calcium chromate pigment can be used for the preparation of inhibitive primers for corrosion prevention of ferrous and non-ferrous metals. At present, the use of this pigment is not known in the country.

The process developed at the Central Electrochemical Research Institute, Karaikudi, for the preparation of calcium chromate pigment consists in preparing chromic acid solution, adding chloride-free slaked lime to the solution, and filtering and drying the calcium chromate formed. The physical properties of the pigment have been tested and it is found that the product can be used as a pigment for paint preparation. The primer prepared using this pigment was evaluated by electrochemical tests, accelerated tests and field tests in comparison with zinc chromate primer.

The tentative cost estimates for a 100 tonnes/annum plant are as follows: fixed capital on equipment erection, Rs 88,000; working capital (for 90 days), Rs 5,77,000; cost of production per kg, Rs 22; and profitability, 31%.

Indian Pat. 303/Cal/75

Improvements in or relating to the production of blue ultramarine

S.B. Chaudhury & B.K. Saikia
Regional Research Laboratory, Jorhat

Ultramarine blue is used in interior paints, toner whitener, enamels, emulsion paints, special kinds of printing inks, laundry bleaches and in paper-making.

The usual method of manufacture of blue ultramarine consists in calcining a well-ground mixture of kaolin, silica, sodium carbonate, sulphur and resin, or carbon, in a muffle furnace at about 815°C over 24 hr, or longer, followed by slow cooling over 3 to 6 days.

The method, covered under this patent, consists in thorough mixing of finely ground kaolin, sodium sulphide and carbon in a definite proportion with a catalyst and calcining the product at 800°C for 8 hr. This process has an advantage over other methods in that the calcination period is reduced considerably and hence ultramarine blue can be produced rapidly. The process has been standardized on a bench scale.

Indian Pat. 1223/Cal/76

Process for the manufacture of methyl anthranilate from phthalimide

M. Bapuji, Y.R. Rao & S.N. Mahapatra
Regional Research Laboratory, Bhubaneswar

Methyl anthranilate finds use in perfume and flavour compositions for soaps, cosmetics and incense sticks. The annual requirement of this chemical is expected to be 15-20 tonnes. Imports during 1974-75 and 1975-76 amounted to about 12 tonnes per annum. In India, methyl anthranilate is produced in small quantities by esterifying anthranilic acid with methanol in the presence of hydrochloric acid. This process is often reported to give an inferior-quality product not always suitable for good-quality perfume preparations.

The Regional Research Laboratory (RRL), Bhubaneswar, has developed a process for the manufacture of methyl anthranilate from phthalimide. The process is a single-kettle reaction, giving directly methyl anthranilate. As anthranilic acid is manufactured from phthalimide by several manufacturers in India, there is already an existing capacity for phthalimide production in the country.

In the RRL-Bhubaneswar process, a solution of commercially available phthalimide in alkali is subjected to Hofmann reaction under suitable conditions to get methyl anthranilate. The crude product is extracted into an aromatic hydrocarbon solvent, and after solvent recovery, the ester is distilled under reduced pressure.

A capital investment of Rs 4.03 lakh is required for a plant of 5.22 tonnes/annum capacity. The cost of production is estimated at Rs 67.50/kg (cost of the principal raw material, phthalimide, is taken as Rs 15/kg)

Indian Pat. 1177/Cal/76

A process for the extraction of hecogenin from sisal juice and subsequent conversion to its acetate
C. Srinivasulu, K. Vijayalakshmi, K.M. Rao & S.N. Mahapatra
Regional Research Laboratory, Bhubaneswar

In recent years the importance of steroid sapogenins has been rapidly increasing because they constitute the most efficient and economic starting material for the synthesis of a wide spectrum of steroid hormones. Of the sapogenins available from the vegetable kingdom, diosgenin, hecogenin and solasodine are the important ones and these are being utilized by pharmaceutical industries throughout the world. Although diosgenin (obtained from *Dioscorea* spp.) is the preferred raw material, hecogenin (obtained from *Agave* spp.) is gaining importance as an alternative raw material for the synthesis of steroid hormones. Hecogenin occurs in the leaves of *Agave sisalana* (sisal), which is grown mainly for its fibre and to some extent as a soil conservation measure. The juice or waste obtained after decortication of leaves can be used as the raw material for the preparation of

hecogenin. The waste is presently used as a mulching material for sisal plantations. It is estimated that about 2000 tonnes of sisal juice would be available from the various farms in Orissa itself.

A process for the extraction of hecogenin from sisal juice and its subsequent conversion to its acetate has been worked out at the Regional Research Laboratory (RRL), Bhubaneswar. The process consists essentially in concentrating the juice, its hydrolysis with a mineral acid, extraction of the hydrolyzed material with a solvent, recovery of crude hecogenin (in about 0.1% yield) and its conversion to acetate and crystallization. However, the product obtained is contaminated with tigogenin. Bench-scale experiments on the process are under way.

PERSONNEL NEWS

Shri A. Krishnan

Shri A. Krishnan, Scientist E, Indian National Scientific Documentation Centre (INSDOC), New Delhi, has assumed the additional charge as Scientist-in-charge, INSDOC, in place of Shri T.S. Rajagopalan who is presently on Unesco assignment, with effect from 5 June 1978.

Appointments/Promotions

Dr N.R. Ayyangar

Dr N.R. Ayyangar of the National Chemical Laboratory (NCL), Poona, has been appointed, on promotion, Scientist EI with effect from 26 April 1978.

Dr Ayyangar (born 21 Dec. 1930) obtained his B.Sc. (1952) from the University of Poona and B.Sc. Tech. (1954) and Ph.D. (1960) from the University of Bombay. As a post-doctoral research associate at Purdue University (with Prof. H.C. Brown) and Illinois Institute of Technology (with Prof. R. Filler), USA (1961-64), he worked on hydroboration and organofluorine compounds. He joined NCL in July 1965. As a project leader, Dr Ayyangar has been responsible for the development of several processes for

industrial organic chemicals, dyes, dye intermediates, drugs and pesticides, many of which have been released to industries. With main interest in the area of dyestuffs, Dr Ayyangar is currently engaged in the reorganization of the dyestuff group in NCL. He was a convener-member of the dyes planning group of the chemical industry panel of the National Committee on Science and Technology (1972-73). Recently he had been to West Germany on deputation and visited the dyestuff units of some of the well-known firms. Dr Ayyangar has a number of research publications and patents to his credit.

Dr Y.K. Sarin

Dr Y.K. Sarin of the Regional Research Laboratory (RRL), Jammu, has been appointed, on promotion, Scientist EI with effect from 12 June 1978.

Dr Sarin (born 20 Oct. 1933) obtained M.Sc. (1956) in botany from the Rajasthan University and Ph.D. (1972) from the Kashmir University. Before joining RRL, Jammu, in 1960, he worked in the Botanical Survey of India.

For more than 22 years Dr Sarin has been engaged in research on floristics, forest ecology and applied economic botany. He has made important contributions to the development of forest-based plant raw materials of industrial value, especially those utilized by drug, pharmaceutical and essential oil industries. His work has led to the commercial utilization of a number of plants, well known among them being *Skimmia laureola* (source of linalyl acetate), *Dioscorea deltoidea* and *Costus speciosus* (source of diosgenin), *Heracleum candicans* (source of xanthotoxin), Indian species of *Datura* (for tropane alkaloids), *Fagopyrum tataricum* (source of rutin), and Himalayan lichens (source of oakmoss type of resinoids). He has carried out detailed studies on the structure and composition of temperate forests in Jammu-Himalayas and productivity of minor forest products in them.

Dr Sarin has been the honorary secretary of the standing committee on

forest based industries of Jammu and Kashmir; leader of the study team on production of pyrethrum and belladonna in Kashmir; member of forest utilization committee of Himachal Pradesh; and member of direction committee on export potential survey of Jammu and Kashmir. He is a recognized guide for Ph.D. of the Jammu University. He is heading the Division of Plant Survey and Herbarium in RRL, Jammu. Dr Sarin has more than 70 research papers and 14 technical reports to his credit.

* * *

The following personnel have joined the Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, as Scientist B: Dr Apurba Sarkar (29 March 1978), Dr N.K. Patra (1 April 1978) and Shri N.C. Shah (11 April 1978).

Transfers

Shri Kartar Singh has joined CIMPO as Administrative Officer (Grade I) on transfer from the National Environmental Engineering Research Institute, Nagpur (1 July 1978).

* * *

Dr K.K. Singh has joined CIMPO as Scientist C on transfer from the Regional Research Laboratory, Jorhat (5 July 1978).

New CIMPO Regional Centre in West Bengal

The Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has opened a new regional centre at Anselgunj in the Darjeeling Dist. of West Bengal. The centre has started functioning in a 1.6 ha plot of land. The land belongs to the erstwhile Ansel tea estate and is located on the main highway between Siliguri and Darjeeling. The place (alt. 1650 m) is within 1 km of Tung railway station.

Another 160 ha of land at Marma (alt. 1050 m), 15 km from Kurseong, is expected to be handed over to CIMPO shortly by the Government of West Bengal. The land is almost plain, devoid of forest trees and traversed by a river, which is to be tapped as a perennial source of irrigation.

This CIMPO centre will carry out R & D work on *Dioscorea* sp., ipecac, peppermint and other potential medicinal and aromatic plants.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 15/78

It is proposed to appoint a Scientist F in the Manpower Division of the Council of Scientific & Industrial Research, New Delhi.

Job Requirements: The position involves the tasks of maintaining the National Register of Scientific and Technical Personnel at home and abroad, up-to-date information/data on scientific/engineering experts and personnel in different fields, to match talents with tasks, setting up Technology Manpower Bank, manpower research and surveys pertaining to availability and utilization of scientific and technical personnel, employment assistance to such personnel, operation of the Scientists' Pool, publication and dissemination of information on scientific and technical manpower, personnel policy, recruitment policy and related matters connected with appreciation and utilization of scientific and technical manpower.

Qualifications/Experience: The selected candidate will be required to provide leadership and guidance in this area of activities. The candidates should possess good qualifications in science or engineering or technology and sound knowledge, experience and understanding of the problems of scientific and technical manpower of India, personnel and recruitment policies and related subjects.

Persons interested may obtain six copies of the standard proforma, for sending their *curriculum vitae*, from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi.

Salary/ Conditions of Service: The salary scale attached to the post would be Rs 2000-125/2-2500. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in the case of deserving candidates.

All correspondence in this regard may be addressed to the Chief (Administration), Council of Scientific & Industrial Research (CSIR), Rafi Marg, New Delhi 110001 and completed *curriculum vitae* proformae must be received in this office on or before 1 September 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Dr Basu Appointed CMERI Director

Dr S.K. Basu, Acting Director, Central Mechanical Engineering Research Institute (CMERI), Durgapur, has been appointed Director of CMERI with effect from 6 June 1978.

Dr Basu obtained his B.E. degree (1951) in mechanical engineering from the University of Calcutta and subsequently received training in industries at home and abroad. On his return from UK in 1955, he joined the Indian Institute of Technology (IIT), Kharagpur, as a lecturer and was assistant professor in engineering production from 1961 to 1965. As a recipient of a Unesco fellowship, Basu conducted doctoral research (1959-61) in machine tools design at the Machine Tools Research Institute (ENIMS) and the Machine Tools and Tool Institute, Moscow. He was professor and head of the Mechanical Engineering Department at the Regional Engineering College, Durgapur, from 1965 to 1969. In 1969, he joined the Mechanical Engineering Research and Development Organisation, Poona, as its Deputy Director-in-charge and became Acting Director of CMERI in May 1976.

Dr Basu is a recipient of Sir R.N. Mukherjee Memorial Gold Medal, and Chandra Prakash Memorial Prize (twice) awarded by the Institution of Engineers (India). He has also won a cash prize and a certificate of merit from the Inventions Promotion Board, and



another cash award from the National Research Development Corporation of India in 1977 for development of machinery.

Dr Basu is a fellow of the Institution of Engineers (India) and Institution of Mechanical Engineers (London), and a member of the Operations Research Society of India. He is the chairman of the West Bengal State R&D Committee for small industries set up by the Department of Science and Technology.

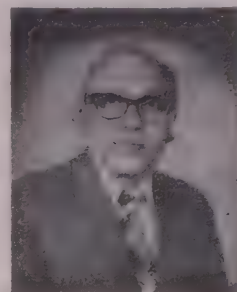
Dr Basu is the author of three textbooks: Design of machine tools; Elements of mechanical engineering; and Works organisation and management. He has to his credit about 80 research papers. Six students have completed their Ph.D. work under his guidance.

Dr Rajendra Kumar Rewarded

Dr Rajendra Kumar, Scientist F, National Metallurgical Laboratory (NML), Jamshedpur, has been rewarded with a scale of pay equivalent to that of the Director, under the Special Merit Promotion Scheme, with effect from 23 June 1978.

Dr Rajendra Kumar has carried out studies both on basic metallurgical processes and the development of technology. His studies on precipitation processes in aluminium alloys have led to the development of aluminium alloy conductors. A major contribution of Dr Rajendra Kumar, along with his colleague, is the development of the electric-grade aluminium alloy NML-PM2. This alloy, which possesses a unique combination of electrical and mechanical properties, is in commercial production.

Dr Rajendra Kumar has been associated in the development of substitutes for copper-based conductors for use in railway electrification as catenary conductors and grooved contact wires. The NML-



PM53 alloy-based catenary conductor is to be field-tested by the Railways.

Following their studies on the structure of liquid metals, Dr Rajendra Kumar and his co-workers worked on the development of casting technology for aluminium base alloys and, as a result, developed grain refiners which can be added to the melt either as pellets or continuously fed as wire inoculants.

Another of Dr Rajendra Kumar's contributions relates to the manufacture and processing technology of filler wires (NML-PM6) used in welding of aluminium. The product has been found acceptable by the Hindustan Aeronautics Ltd. Dr Rajendra Kumar's team is currently studying the formation of metastable phases during rapid solidification of aluminium with a view to developing new grades of high-strength alloys.

Through the central creep testing facility, Dr Rajendra Kumar and his team are involved in the national programme of development of creep-resistant high-temperature steels for use in the generation of electrical energy, both thermal and nuclear.

Dr Rajendra Kumar's efforts have brought about close collaboration between NML and the metallurgical industry.

Dr Rajendra Kumar served as a member of the Enquiry Committee constituted by the Department of Power, Ministry of Energy, to examine the working of two thermal power stations at DVC, Chandrapura, and Badarpur.

For his research contributions to metallurgical sciences and technology, the University of Sheffield conferred on Dr Rajendra Kumar a D.Sc. degree in metallurgy (1974). Dr Rajendra Kumar is a recipient of the National Metallurgists' Day Award, of Binani gold medals (successively for 1965 and 1966), and of Alumnus Award (1973) from the Banaras Hindu University (BHU). He is a Fellow of the Institution of Engineers (India).

Author of more than 125 research papers, Dr Rajendra Kumar has also to his credit a book titled 'Physical Metallurgy of Iron & Steel' for which he was given Indranil Award by MMGI.

Dr Rajendra Kumar graduated in metallurgical engineering from BHU, Varanasi, in 1950 and received his master's degree in metallurgical engineering (1954) and Ph.D. (1956) from the University of Sheffield. He was on the teaching faculties of the Indian Institute of Technology, Kharagpur (1956), and BHU, Varanasi (1958-1962). Joining NML as Assistant Director in 1962 he became Deputy Director in 1971.

Polymer Science and Engineering

Workshop at NCL

The National Chemical Laboratory (NCL), Poona, organized a workshop on Polymer Science and Engineering on 11-12 May 1978. The main object of the workshop was (i) to review the current R & D work in India in the field of polymers, (ii) to identify areas of potential importance to polymer industry in India, (iii) to identify areas of basic research in polymer science and engineering, (iv) to survey the existing experimental testing or pilot-plant facilities in various organizations and to

evolve means of optimum utilization of the facilities, and (v) to find out ways and means of close and meaningful collaboration between industry, national laboratories and educational institutions.

The workshop emphasized the need for undertaking basic research in the areas of polymer chemistry, polymer physics, polymer reaction engineering, polymer rheology and polymer processing with a view to developing innovative technologies. Since this would be a long-range activity, it was felt that universities, IITs and national laboratories could undertake work in these areas, care being taken to ensure that the problem area chosen was closely related to the needs of the industry. The workshop further stressed the importance of product research and process development which could be undertaken by national laboratories as well as by the in-house R & D departments in industry. The polymers and monomers requiring particular attention, in the opinion of the participants, were Chloroprene, fluoro polymers, silicon rubbers and polymers, nylon-4, nylon-11, EVA copolymer, polysulphones, polycarbonates, polyamides, polyacetals, polyacrylamide (for effluent treatment), styrene-butadiene rubber (by solution process), silane coupling agents and 1,2-butadiene.

Based on the deliberations, the workshop suggested a number of areas for R & D work relating to modification of natural polymers, development of biodegradable polymers, use of polymers in agricultural and rural development, conversion of natural polymers into food source, and agro-based fillers and polymeric composites. Stress was also laid on reduction of cost of raw materials and augmentation of the efficiency by utilization of the byproducts of petroleum industry. The workshop also laid emphasis on the development of auxiliaries such as inhibitors, UV stabilizers, pigments, polymerization and curing catalysts, flame retardants for synthetic fibres,

and low-energy processes for production of conventional polymers.

Thirty-four participants representing national laboratories, educational institutions, industry and a space technology centre attended the workshop.

CECRI's Prototype Chromium Cell Inaugurated

Based on its electrolytic process for the production of chromium metal on a semi-pilot plant scale, the Central Electrochemical Research Institute, Karaikudi, has commissioned a 1500-A prototype cell capable of producing 2 kg of chromium metal per day. The plant was formally switched on by Shri V. Selvaraj, Director of Industries, Tamil Nadu Government, on 30 April 1978.

Chromium metal in the form of powder finds application in the manufacture of special welding electrodes and special chromium alloys. A potential exists in the country for marketing 50-75 tonnes of chromium powder annually for the welding electrodes industry.

CMRS Develops Respiratory Equipment

The Central Mining Research Station (CMRS), Dhanbad, has designed and developed three types of respirators for protecting workers exposed to ammonia gas, acid fumes, and dust.

The respirators were tested both at CMRS and the Central Labour Institute, Bombay, and were found to show good performance in terms of both resistance and filtration. The efficiency of each respirator was found to be well above the minimum required standards stipulated by the Indian Standards Institution and the United States Bureau of Mines. Indigenous-made respirators of these types available in the market are inferior in quality and do not conform to the minimum safety specifications.

The know-how for the respirators has been released for commercialization and these respirators are expected to be available in the market shortly.

Synthesis of Thiol Monomers and Polymers, and

Organosilicon Compounds

Compounds with -SH function (mercaptans) enter into reactions beyond the reach of their oxygen analogues, creating entirely new and useful structures. For this reason the mercaptans have become the basic building blocks for a wide range of defoliants, insecticides, fungicides and active pharmaceuticals. They are used in the preparation of antioxidants, stabilizers for synthetic polymers (as curing or crosslinking agents for polymer systems), and for the prevention of discoloration of polyurethane foams. They are also useful as radical initiators in the polymerization of olefins and as shrink-proofing and crease-resistant finishing agents in cotton and woollen textiles.

Mercaptans are synthesized by many methods of which the very convenient and important method for the preparation of compounds with two or more -SH groups is by reaction of polyhydroxy compounds with mercapto acids.

Shri R.A.N. Murthy, a CSIR senior research fellow working at the National Chemical Laboratory, Poona, under the guidance of Dr N.D. Ghatge, prepared a series of thiol-terminated esters from polyhydroxy compounds and thioglycolic acid (HSCH_2COOH). Poly(thioglycolates) were prepared from polyhydroxy compounds such as ethyleneglycol, diethyleneglycol, polyethyleneglycol-200, -400 and -600, and castor oil. In case of castor oil tris(thioglycolate), which was a new trithiol and which showed a strong tendency to form insoluble film on exposure to air, *cis-trans* isomerization of the double bond, in castor oil, was noticed.

Shri Murthy also synthesized some new amino functional compounds, which are used extensively in a multitude of epoxy resin-based applications, using: (i) diethylenetriamine, and tetraethylenepentamine; (ii) phenol and 3-

pentadecadienylphenol (cardanol); (iii) a thiol-terminated polysulphide liquid polymer; (iv) bis(thioglycolates) of ethyleneglycol, polyethyleneglycol-200, -400 and -600; and (v) para-formaldehyde. The curing properties of the amino functional compounds with Araldite LY-553 liquid epoxy resin were studied in different proportions and at two different temperatures. It was found that the curing properties of the amino functional compounds from ethyleneglycol-bis(thioglycolates) were comparable to those from polysulphide liquid polymer.

The polythiourethane polymers were prepared using either 2,4-tolylene diisocyanate or 4,4'-diphenylmethane diisocyanate and a few thioglycolates. The polythiourethanes showed excellent elongation, hardness and good resistance to organic solvents. Their tensile strength ranged from 980 to 1450 psi.

Polyimidothioether polymers were synthesized using two aromatic bismaleimides, viz. (i) N,N'-O-phenylenebismaleimide and (ii) N,N'-bismaleimide-4,4'-diphenylmethane, and a few bis(thioglycolates).

Attempts were also made to prepare rubbery products from castor oil tris(thioglycolate) by curing with lead peroxide and *p*-quinone dioxime in a manner analogous to the curing of thiol-terminated polysulphide liquid polymers using inorganic fillers such as carbon black, titanium dioxide and silica. Castor oil tris(thioglycolate) was also cured in conjunction with polysulphide liquid polymers LP-32 and LP-2 using the same curing agents. The tensile properties of these polymers were studied.

Shri Murthy also prepared two new organosilicon compounds, viz. (i) di(phenylthio)diphenylsilane and (ii) tris(phenylthio)phenylsilane, and evaluated them as thermal stabilizers for plasticized PVC.

The thermal stabilization potency of organosilicon compounds was found to be better than that of the metal soaps.

Shri Murthy has been awarded Ph.D. degree (chemistry) of the University of Poona for his thesis based on these studies.

Biologically Active Peptides

Bacitracin synthetase offers a model system for the study of non-ribosomal protein synthesis. But, the conventional methods of estimation of this enzyme are unsatisfactory, because they cause drastic cell lysis and thereby inactivate this enzyme. Moreover, the present bioassay methods fail to study fresh bacitracin formed during the enzyme reaction.

Shri A.K. Agarwal of the Central Drug Research Institute (CDRI), Lucknow, attempted to work out a method which would cause mild lysis of the cells of *Bacitracin licheniformis* strain RC4. He produced graded lysis of the cytoplasmic membrane of spheroplasts by lipase treatment. For bioassay of bacitracin synthetase, *Micrococcus flavus* was used as the test pathogen. Filter paper discs of 6 mm diam. were placed on seeded agar reduced to the thickness of unicellular layer, and test samples were applied with a micropipette. After incubation at 30°C for 18 hr, clear zones indicative of bacitracin concentration were recorded. This method improved the sensitivity by 70-80 times.

Labelled amino acids were used for assay of fresh bacitracin synthesis. Bacitracin with labelled amino acids formed during the enzyme reaction was separated by polyacrylamide gel electrophoresis. Bacitracin from the cut gel pieces was extracted with liquid ammonia and then counted with PPO in a liquid scintillation counter. Labelled bacitracin was assayed by thin layer chromatography coupled with radio-scanning. The spot corresponding to bacitracin was scraped out, suspended in toluene with PPO and counted in a liquid scintillation counter.

Shri Agarwal has further attempted to confirm the hypothesis that a foreign body in a living system is recognized through its mRNA. The nature of RNA

formed in spleen cell cultures in the presence of a synthetic peptide Glu₆₇ Lys₂₆ Tyr₇, whose RNA should largely contain purine, has been studied. It has also been established that ¹⁴C-rich RNA is formed in the presence of ¹⁴C-adenine.

Shri Agarwal has been awarded Ph.D. degree by the Lucknow University for his thesis based on these studies. The work was done under the guidance of Dr M.M. Dhar of CDRI.

Deputation Briefs

Dr Inder Singh of the National Metallurgical Laboratory (NML), Jamshedpur, was deputed to the Corrosion Division of the National Research Institute for Metals (NRIM), Tokyo, under the Japanese Government Research Awards for Foreign Scientists Programme (of the Science & Technology Agency of Japan), from October 1977 to April 1978.

Dr Singh acquainted himself with the activities of the various sections of the Corrosion Division, viz. oxidation of metals, stress corrosion cracking of ferrous and non-ferrous alloys, water corrosion, anodization of aluminium and its alloys, and atmospheric corrosion of metals and alloys.

Dr Singh also visited the metal exposure sites at Yokosuka and Choshi areas. During his stay at NRIM, he systematized the work on 'Atmospheric corrosion of metallic materials'. Later, on his suggestion, a project was taken up on 'Development of sensor for recording wetness of metallic surface instantaneously'. Dr Singh successfully developed a sensitive sensor which records the wetness of metallic surfaces minutely during moisture condensation in the night and rainy and snowing periods. The sensor developed is now being employed at NRIM for this purpose and it is proposed to use it at three exposure sites in India, viz. Jamshedpur, Digha and Madras, for studying the atmospheric corrosion of metals. The main advantage of this sensor is that it does not require any external emf for its operation.

Dr Singh also visited a number of research institutions and universities and companies having corrosion problems. He also acquainted himself with the various researches on atmospheric corrosion of metals being carried out in Japan and the level at which these investigations were being carried out.

A comprehensive programme of collaboration between NML and NRIM is being worked out as a result of his visit.

* * *

Shri Dinesh Elhence of the Indian National Scientific Documentation Centre, New Delhi, visited France under the Bilateral Exchange Programme between India and France during March-May 1978 for studying the manual and machine methods of abstracting services, current awareness services, selective dissemination of information services, bibliography services and computer-based information systems and services including on-line information services. Shri Elhence visited the documentation

centres of Centre National de la Recherche Scientifique, Paris; Institut Francais du Petrole, Rueil-Malmaison; Centre National de Recherches Agronomiques, Versailles; Institut Textil de France, Boulogne sur Seine; and Institut de Recherche sur les Dechets Solides, Paris.

Conference Briefs

Dr M.S. Narasinga Rao of the Central Food Technological Research Institute, Mysore, attended the Fifth International Rapeseed Conference held at Malmo (Sweden) from 12 to 16 June 1978 as a member of a four-man Indian delegation. He presented two papers on (1) Scope for better utilization of rapeseed; and (2) Effect of SDS on the major fraction of mustard protein.

Dr Rao also visited the AB Karlshamns Oljefabriker at Karlshamn; the Institute of Nutrition, Department of Chemistry and Biomedical Centre of the Uppsala University at Uppsala; and the Carlsberg Laboratory at Copenhagen where he had discussions with the scientists on food proteins.

NAL'S WIND ENERGY UTILIZATION PROGRAMME FOR RURAL DEVELOPMENT

Wind energy is an attractive, though a non-conventional, resource in the Indian context. It has the advantage that it is distributed all over the country. This permits its economical exploitation on a small scale for water-pumping and several other applications in villages without the usual problems of elaborate infrastructure as is required in the case of electricity. This is of considerable importance since small farmers so far have not been able to take full advantage of modern energy sources. Other advantages in using wind energy are simplicity of energy conversion devices, easy maintenance, zero fuel cost and freedom from pollution. Though windmills require relatively higher initial investments, the overall cost incurred over a 25-30 years' period is not necessarily higher than that incurred on the other alternatives.

In recent times considerable attention is being paid to simple, low-technology windmills which are fabricated with the use of locally available raw materials. Such windmills could be constructed and maintained by village craftsmen, and significant cost savings could be achieved.

The National Aeronautical Laboratory (NAL), Bangalore, has evinced great interest in the wind-energy programme right from the day the earliest organized effort in its utilization began in this country. The capability developed intermittently over the past decade or so has led to a number of developments.

Windmill WP-2

During 1960-64, a windmill for water-pumping was developed and field-tested. This windmill, WP-2, is of a

simple, robust construction requiring very little maintenance. It operates without manual attendance and furls itself in high wind speeds. It responds to wind speeds of as low as 8 kmph and ensures satisfactory operation at most of the places in India. This windmill is especially useful in drinking-water supply schemes envisaged for villages. The cost on single unit order basis is estimated at about Rs 15,000.

The laboratory has so far installed more than 60 such windmills at several places in the country. One such windmill has been installed for lifting water from a well at Manekondur village in Karimnagar Dist. of Andhra Pradesh. This is the only well in the village which supplies uncontaminated drinking

water through taps. There are plans to put up more windmills in this backward district.

The specifications of the WP-2 type windmill developed by NAL are:

Rotor diam.	: 4.87 m
No. of blades	: 12
Tower	: 4-post, 9.76 m high
Cut-in wind speed	: 8 kmph
Rated wind speed	: 16 kmph
Furling wind speed	: 48 kmph
Pump	: Reciprocating, 12.7 cm stroke single acting

From 1964 till about 1974, there was not much activity in this area. But, because of the rise in oil prices and environmental pollution resulting from the use of fossil fuels, interest has been

renewed all over the world in the alternative sources of energy. Consequently NAL revived its wind power programme during 1974

Vertical-Axis Windmill

The experimental work done at the National Research Council, Canada, during 1971-75, has shown that the vertical-axis windmill of egg-beater shape has some advantages. Such windmills are mechanically simple, have reasonably high aerodynamic efficiencies and are insensitive to wind direction. Subsequently, a programme was started at NAL to study and develop these windmills.

A 5-m high Darrieus rotor was designed and fabricated for experimental evaluation. This rotor could generate power equivalent to 1 kW in regions with moderately high mean wind speed of 25 kmph. To counter the problem of non-availability of starting torque, NAL used Savonius starter buckets. The investigations have shown that these windmills are not suited for direct water-pumping as the starting torque problem continues to bother windmill designers, although such windmills are attractive for generating electricity.

10-m Sail Windmill

The windmill WP-2 is rather expensive, though it has a life of 25-30 years. Further, its capacity for irrigation is limited. In order to reduce the cost and increase the capacity, NAL is developing a 10-m diam. sail windmill. This windmill comprises six triangular sails mounted on tubular spars each of 5 m length. The shaft rotating is transmitted at right angles through the axis of the tower for energizing a swinging vane rotary pump. The main advantage of such a pump is its better matching with the characteristic of the rotor, especially during the start-up. The torque requirement for such a pump is fairly low at the start and this helps lower the cut-in wind speed. This windmill also operates with lesser solidity than the conventional multivane windmills coupled with reciprocating pumps. The windmill has been evolved to extract energy for



Windmill WP-2 developed by NAL



Prototype of the 10-m sail windmill developed by NAL

pumping 150 litres of water per minute over a head of 7 m in wind speeds of as low as 6-8 kmph.

The prototype has been made mainly from items bought from the local hardware market. The cost of material and hardware is Rs 5950, which includes Rs 1500 for the rotor (inclusive of canvas), Rs 800 for the head mechanism, Rs 850 for the power transmission and lower gear box, Rs 2000 for the tower inclusive of wire ropes and foundation, and Rs 800 for the pump. The cost of machining is extra. With some modifications in the design of head mechanism, it should be possible to fabricate this windmill at a cost of Rs 10,000 or less.

Studies show that even at this price, they can compete in some parts of the country, such as Rajasthan and Gujarat, with other sources of energy when the total cost, including the laying of power lines or the cost of fuel, etc., is considered. This windmill is undergoing preliminary tests for assessment of its performance and economics.

During February-May 1978, this windmill was operated against a head of

7 m and it was able to deliver 45 to 115 litres of water per minute in the wind speeds ranging from 1.9 to 5.0 m/s. Its speed is found to range from 8 to 30 rpm in the above range of wind speeds. The 7-m head and 105 litres/min. combination is equivalent to 130 W and this loads the windmill only partly. Attempts are being made to load the windmill further. The tip speed ratio under the current loading is about 2.5.

The windmill will be tested thoroughly for about a year. Improvements, especially in regard to safety of sails, will be taken up later. A modified version of the vane pump of a larger discharge capacity is being designed.

Future Programme

Encouraged by the preliminary performance data of the sail windmill, NAL has proposed to take up another design cycle to further reduce the cost of components and at the same time develop a range of rotary pumps to suit various heads and output requirements. Field trials on the use of these windmills for irrigation will also be carried out. NAL has proposed to interact with other agencies working at village levels, such as the Centre for Science for Villages, in establishing a number of such windmills for water-pumping.

PROGRESS REPORTS

CDRI Annual Report: 1976

The annual report of the Central Drug Research Institute (CDRI), Lucknow, for 1976 shows that the laboratory investigated 88 multidisciplinary projects, both long-term and short-term, under eleven broad areas: Antifertility agents; Parasitic infections; Amoebiasis; Cholera immunology; Viral infections; Natural products; Cardiovascular and nervous system disorders; Disorders of carbohydrate and lipid metabolism; Cancer; Fermentation technology; and Process development of drugs and pharmaceuticals.

Production of amitriptyline was started by Kembiotic Collaborators, Bombay, on the basis of CDRI know-how.

The collaborative project with Unichem Laboratories, Bombay, for scaling up a process for *l*-ephedrine was completed. Trial commercial production of the intermediate *l*-acetylphenylcarbinol was reported by the firm.

A laboratory process for the enzyme pepsin was transferred to industry through the National Research Development Corporation of India. Processes for indomethacin, dapsone, nitrofurantoin and protein hydrolysate were also released to industry.

The preparation of the semi-synthetic penicillin ampicillin from indigenously produced 6-aminopenicillanic acid was standardized and demonstrated to the sponsor. A process for sulphamethoxazole, an imported antibacterial drug, was developed on 1 kg scale under a sponsored project. A continuous process for the production of *p*-aminophenol from indigenously available nitrobenzene was standardized and a semi-pilot plant was designed and erected to study the economics of the process.

Laboratory processes for trimethoprim, diloxanide, prenylamine, metronidazole and chlorpheniramine maleate were standardized.

A new cervical dilator was developed using the husk of the indigenous plant *Plantago ovata* (Hindi: Isabgol), as a substitute for imported 'laminaria tent' used in medical termination of pregnancy.

The laboratory developed a device for delivering a chemical at the utero-tubal junction in rhesus monkey. The device will facilitate the screening of tubal occluding agents.

A cavity slide method was developed for rapid screening of antiamoebic compounds against axenically grown *E. histolytica* and monoxenic *Naegleria aerobia* and *Hartmannella culbertsoni*.

Phase I clinical studies (multiple dose) were completed with the new antifilarial compound Centperazine, and permission was received from the Drugs Controller for undertaking phase II trial. The compound was found to be

readily absorbed from the intestine.

Centsulphone, a promising anti-tapeworm agent, was cleared by the Drugs Controller for phase II clinical trial. A new naphthanilide derivative was found to be very active against natural *H. diminuta* infection in rat and large tapeworm infection in dog at 7.5 mg/kg dose.

Single dose phase I clinical trial as well as a detailed study of the pharmacology of Centbutindole, a new long-acting neuroleptic, was completed. The compound did not show the usual withdrawal symptoms of an addicting agent and its anti-emetic effect appeared to be due to its action on the chemoceptor trigger zone and the vomiting centres.

Phase II clinical trial of Centazolone, a tranquilisedative, was completed in three hospitals. Varying degrees of improvement were observed in more than 50% of cases of anxiety neurosis. The compound was also found safe in chronic toxicity studies.

A fraction of the oleoresin of *Commiphora mukul* (Guggul) showed marked hypolipidemic action in monkey; it was found safe in sub-acute toxicity study.

The hydro- and keto-derivatives of coleonol, isolated from *Coleus barbatus*, were found to have greater hypotensive activity than the parent compound. Clausmarin A from *Clausena pentaphylla* showed better spasmolytic activity than papaverine.

Pure antigen was prepared from axenically grown *E. histolytica* to facilitate serodiagnosis of amoebiasis and development of a vaccine for the disease. Countercurrent immunoelectrophoresis was found to be a rapid method for serodiagnosis of antisera from humans and rabbits. Sera from symptomatic cases gave 100% positive reaction with the antigen. Hamsters immunized with a low dose of 1 mg antigen plus complete Freund's adjuvant for a month showed 50% protection against challenge with virulent *E. histolytica*.

A copper intra-uterine device was

found to greatly increase the formation of hydrogen peroxide by the whole tissue as well as the mitochondrial fractions of the endometrium; this would indicate a possible long-term effect of the device. Simulation of

estradiol uptake by uterine and cervical tissues was observed with the device in monkey and rabbit.

One hundred and twenty-two research papers were published and nine patents were filed.

CSIR SUPPORT TO RESEARCH

Biogenesis and Assembly of Electron Transport Components in *Esch. coli*

When *Esch. coli* is grown in a medium containing glucose, there occurs a repression of the electron transport activity accompanied by a disturbance in the structure and composition of the protoplasmic membrane. Shri S.V. Ambudkar, while working as a CSIR research fellow in the Department of Biochemistry, Madurai University, Madurai, attempted to correlate the membrane lipids and the electron transport components in the membranes with the help of the specific mutant AN120, derived from the wild

type AN180. This mutant, also termed as uncA⁻ (for uncoupled mutant), was shown to be deficient in oxidative phosphorylation. The ATPase enzyme was found to be apparently normal but not integrated into the membrane and hence not able to carry out its normal physiological function. The extracts of the mutant were analyzed for ATPase activity and it was found to be very low as compared to that of the wild type. But when phospholipid extracts of the wild type or pure cardiolipin were added, the activity was restored, and the DCCD sensitivity, an indication of membrane association, was also restored. Phospholipid analysis of the mutant also revealed deficiency in cardiolipin.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Mustard Powder from Mustard Seeds: Improved Process

The Central Food Technological Research Institute (CFTRI), Mysore, has developed an improved process for the production of mustard powder from mustard seeds. The powder can be used in the preparation of mustard paste, table mustard and other mustard products.

The process consists of the following steps: conditioning graded black mustard seeds to loosen the husk; splitting and dehulling conditioned and dried seeds; screening and air-classifying the mixture of husk and cotyledons into individual fractions; and grinding the cotyledons to desired fineness in a triple roll mill to obtain mustard powder.

The laboratory has carried out processing on a scale of 10 kg of seed per batch.

The composition of the mustard powder prepared by the CFTRI process nearly conforms to IS specifications and is as follows (IS specification in parenthesis): moisture (max.), 5.0% (6.0%); volatile oil (min.), 0.51% (0.35%); non-volatile ether extract (min.), 35.0% (27.0%); total ash (max.), 3.8% (6.0%); acid-insoluble ash (max.), 1.1% (1.5%); starch, 2.1% (2.5%); and crude fibre (max.), 4.9% (6.0%). The samples of the mustard powder have been found favourable to the consumers.

Good-quality bold black/yellow mustard seed, which is available indigenously, is the raw material required.

The main items of equipment required are seed grader, kettle drier, plate mill, grader, classifier, triple roll mill, and boiler. All are available indigenously.

The minimum capacity of an economic unit, as suggested by CFTRI, is 500 kg of mustard powder per day (one 8-hr shift). The capital investment required for a mustard powder plant of this capacity is Rs 5.21 lakh, comprising Rs 2.30 lakh on plant and machinery, and Rs 2.91 lakh as working capital. The cost of production as estimated by CFTRI is Rs 725 per quintal of mustard powder. The present market price of mustard powder is Rs 8-12/kg.

Further particulars may be obtained from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PATENTS ACCEPTED

Indian Pat. 67/Cal/75

Improvements in or relating to sintered porous metal hydrogen electrodes used in low-temperature hydrogen-oxygen fuel cell

V.K. Venkatesan, H.V.K. Udupa, R. Pattabiraman, T.R. Jayaraman & C.P. Janaki Amma Indira

Central Electrochemical Research Institute, Karaikudi

The process covered by this patent relates to the preparation of sintered porous metal electrodes containing catalysts to be used as hydrogen and oxygen electrodes in fuel cells.

Skeletal Raney nickel powder is used as electrocatalyst for hydrogen oxidation. Commercially available Raney nickel powder is treated with alkali to get activated and preserved skeletal catalyst. The two-layer DSK (Doppel Skeletal Katalysator) type electrodes are prepared by cold-pressing. The electrodes consist of a protective layer containing pure nickel and an operating layer consisting of pure nickel, preserved skeletal Raney nickel catalyst and a suitable filler. The composition and particle size of the two layers have been standardized. The cold-pressed electrodes are sintered at a high temperature in an inert atmosphere.

Tested as gas diffusion electrodes in 6.0 N KOH solution at 60° C at a hydrogen gas pressure of 0.8-1.2 atm

(gauge pressure), the electrodes maintained an initial rest potential of -40 mV vs hydrogen electrode in the same solution; polarization was 150 mV at a current density of 60 mA/cm².

The electrodes can be used in low-temperature hydrogen-oxygen fuel cells as anodes and as valve electrodes (cathodes) in electrolyzer cells to store hydrogen.

Indian Pat. 32/Cal/75

Improvements in or relating to sintered porous metal electrodes containing silver catalysts for use as oxygen electrodes in low-temperature hydrogen-oxygen fuel cells

V.K. Venkatesan, H.V.K. Udupa, K.S.A. Gnanasekharan, R. Pattabiraman, T.R. Jayaraman, C. Janaki Amma Indira & R. Chandrasekharan

Central Electrochemical Research Institute, Karaikudi

This patent covers the process relating to the preparation of sintered porous metal electrodes containing silver catalysts for use as oxygen electrodes in low-temperature hydrogen-oxygen fuel cells.

Silver catalysts of different types such as silver on alumina, silver-cadmium on alumina, silver-included acetylene black and silver obtained from silver carbonate are used as electrocatalysts for oxygen reduction. Silver on alumina and silver-cadmium on alumina are prepared by co-precipitation. Any one of the catalysts mixed with pure nickel powder and a suitable filler forms the operating layer. Pure nickel serves as the protective layer. The protective and operating layers are compacted by cold-pressing and sintering the compact at a high temperature in an inert atmosphere. The particle size and composition of the two layers have been standardized. The electrodes are used as cathodes in low-temperature H₂-O₂ fuel cells.

Tested as oxygen gas diffusion electrodes in 6.0 N KOH solution at an oxygen gauge pressure of 1-1.5 atm, a typical electrode containing silver-cadmium on alumina (45 mg/cm²) maintained an initial potential of +920 mV (vs hydrogen electrode in the same

solution); polarization was 240 mV at a current density of 60 mA/cm² at 60°C.

The main advantages of the process are that the preparation of the electrocatalysts is simple and the amount of silver catalyst required is smaller than that reported in literature.

Shri G. Ramachandran

Shri G. Ramachandran, Finance Secretary to the Government of India, has been nominated as member (finance) on the Governing Body of the Council of Scientific and Industrial Research with effect from 1 May 1978 vice Shri P.J. Fernandes.

PERSONNEL NEWS

Honours and Awards

Shri S.G. Bhat, Documentation Officer, National Environmental Engineering Research Institute, Nagpur, has won a cash award for his book in Marathi entitled *Pralekhan Parichay* (Introduction to Documentation). This book, the first on documentation written in Marathi, has been published by the Book Production Board of the Maharashtra University.

INDIAN NATIONAL COMMITTEE FOR INTERNATIONAL HYDROLOGICAL PROGRAMME

(Council of Scientific & Industrial Research)

Advertisement No.1/IHP/78

The International Centre of Hydrology, Padua, Italy, will award two scholarships to candidates to join the Fourteenth International Post-Graduate Course in Hydrology to be held from 15 January to 14 July 1979. Selected candidates will be awarded to and from economy class air fare and reasonable living expenses in Italy. Applicants must be graduates in civil engineering and should not be more than 35 years of age as on 15 January 1979. Candidates who have five years' experience in a field related to hydrology and who have not received higher training abroad within the last five years are preferred. Candidates in employment must submit their applications through proper channel. Completed applications must reach the Secretary, Indian National Committee for IHP, CSIR, Technology Bhawan, New Mehrauli Road, New Delhi 110029, on or before 1 September 1978. Requests for application forms accompanied by a self-addressed, stamped envelope (23 cm × 10 cm) should reach the Secretary before 7 August 1978.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

BHATNAGAR PRIZES 1976

Twelve scientists have been named for the Shanti Swarup Bhatnagar Prizes for the year 1976. The recipients of the awards in various disciplines are as follows:

Physical Sciences: Prof. R. Vijayaraghavan, Head, Solid State Physics & Materials Science Group, Tata Institute of Fundamental Research, Bombay; and Prof. C.K. Majumdar, Palit Professor of Physics, Calcutta University, Calcutta.

Chemical Sciences (posthumous award): Prof. D. Devaprabhakara, Department of Chemistry, Indian Institute of Technology, Kanpur.

Biological Sciences: Dr Kishan Singh, Director, Indian Institute of Sugarcane Research, Lucknow; and Dr G.P. Dutta, Scientist, Division of Microbiology, Central Drug Research Institute, Lucknow.

Engineering Sciences: Dr R. Kumar, Department of Chemical Engineering, Indian Institute of Science, Bangalore; and Prof. V. Rajaraman, Department of Electrical Engineering, Indian Institute of Technology, Kanpur.

Medical Sciences: Prof. N.R. Moudgal, Department of Biochemistry, Indian Institute of Science, Bangalore.

Mathematical Sciences: Prof. K.R. Parthasarathy, Indian Statistical Institute, New Delhi, and Prof. S.K. Trehan, Professor of Applied Mathematics, Panjab University, Chandigarh.

Earth Sciences: Dr Mihir K. Bose, Assistant Professor of Geology, Presidency College, Calcutta; and Prof. K.S. Valdiya, Head of the Geology Department, Kumaun University, Nainital.

Electrothermal Process for Calcium Silicide

The Central Electrochemical Research Institute, Karaikudi, has developed an electrothermal process for the production of calcium silicide (calcium content, 30%). The laboratory has also set up a plant capable of producing 27-30 kg of calcium silicide per batch (3-3½ hr) using 380 kVA arc furnace.

Calcium silicide finds major application as a deoxidizing and desulphurizing agent in the iron and steel industry and as an inoculant in foundry casting. It also finds applications in defence-oriented industries.

The present annual demand for calcium silicide is about 100-150 tonnes, and this is being met by imports.

Calcium oxide, ferrosilicon and suitable fluxing agents are the raw materials required, and all these are available indigenously.

The total investment to set up a plant

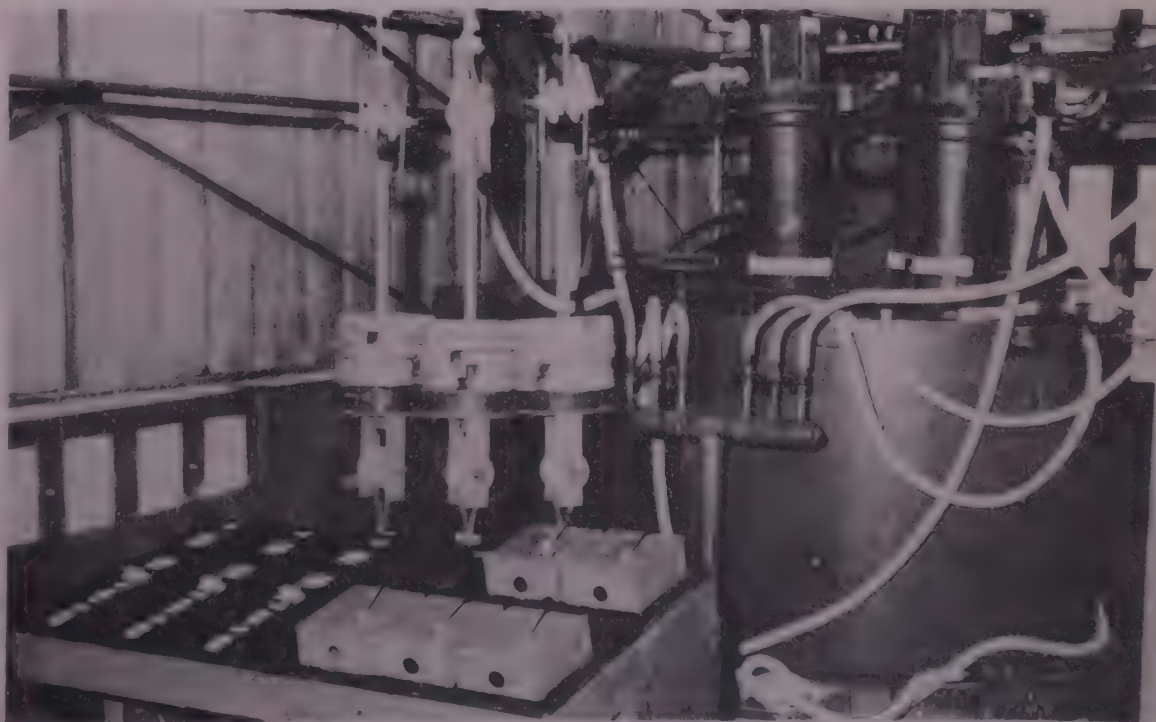
capable of producing 100 tonnes/annum of calcium silicide has been estimated at Rs 12.4 lakh. The production cost has been worked out to be Rs 16/kg and the return on investment at 32%.

Drying of Cocoa Beans

The Central Food Technological Research Institute (CFTRI), Mysore, has standardized processes for small-scale fermentation and drying of cocoa beans, which are required for the manufacture of cocoa products. Cocoa planters can beneficially use these processes for supplying good-quality dried beans to the manufacturers of cocoa powder and chocolate.

At present, the manufacturers of cocoa products collect the wet beans and dry them for use in their products. Also, most of the planters do not have adequate knowledge of fermenting and drying the beans properly.

CFTRI now offers the know-how for fermentation and drying of cocoa beans



Arc furnace (380 kVA) with transformer for production of calcium silicide:CECRI

to cocoa planters by demonstrating the processes at cocoa plantations. The equipment required are wooden trays and an artificial dryer, and these are available easily.

Cocoa cultivation in India has been increasing rapidly, specially in Kerala. Although the present annual production of dry beans is only about 100 tonnes, it is likely to increase within a few years to 1000 tonnes, which can meet the country's requirements.

Titanium Substrate Insoluble Anodes

CECRI PROCESS UTILIZED BY INDUSTRY

Commercial production of titanium substrate insoluble anodes (TSIA) based on the know-how developed at the Central Electrochemical Research Institute (CECRI), Karaikudi, has been started by Titanium Equipment & Anode Manufacturing Co. Ltd (TEAM), Madras. The firm at present manufactures electrodes with an apparent surface area of 3-4 m² per day.

Four leading chlor-alkali manufacturers have switched over to the installation of TSIA (supplied by TEAM) in their chlor-alkali cells and the TSIA-installed cells are reported to be running satisfactorily.

TSIA were developed as an economic substitute for graphite anodes in the chlor-alkali cells. A saving to the tune of Rs 26 million per annum is expected to be realized by the chlor-alkali industry if it switches over to the installation of TSIA in the chlor-alkali cells.

CFTRI M.Sc. Course

The valedictory function of the 1976-78 M.Sc. (Food Technology) course, conducted by the International Food Technology Training Centre of the Central Food Technological Research Institute, Mysore, was held on 6 July 1978. Delivering the valedictory address, Dr H.R. Arakeri, Vice Chancellor of the University of Agricultural Sciences, Bangalore, called upon the food scientists to develop technology for producing inexpensive processed foods which are within the

reach of even the poorer sections of society in rural areas.

Dr Arakeri presented the Girdhari Lal Memorial Gold Medal to Shri Jairus David who stood first in the 1975-77 course. He also distributed certificates of completion to 28 participants from different countries including Afghanistan, Burma, Iran, Nigeria, South Korea, Thailand, Uganda and India.

Presiding over the function, Dr H.A.B. Parpia, Senior Advisor, FAO, Rome, expressed the hope that the participants who successfully completed the course could make significant contributions to the solution of food problems of their respective countries on the basis of knowledge acquired during the training.

CFTRI Course in Flour Milling

An international short-term course in Flour Milling was held at the Central Food Technological Research Institute (CFTRI), Mysore, from 10 to 28 July 1978. Organized by the collaborative efforts of CFTRI, Wheat Associates of USA and Roller Flour Millers Federation of India, the course was attended by 28 participants from Bangladesh, Malaysia, Pakistan, Thailand and India. Dr H.A.B. Parpia, Senior Advisor, FAO, Rome, inaugurated the course.

In his inaugural address, Dr Parpia emphasized the key role of food processing industries in transforming the predominantly agricultural economies of the developing countries into mixed agro-industrial economies and thereby bringing about socio-economic transformation. Because of a great deal of similarity in the problems of food conservation and processing in most of the developing countries, Dr Parpia observed that exchange of experience between them through a well-coordinated programme of technical collaboration would prove beneficial to all of them. FAO would therefore organize at CFTRI, in August 1978, a technical consultation among developing countries for transfer of technology

to develop food and agricultural products conservation and processing industries, Dr Parpia said.

Shri C.P. Natarajan, Deputy Director, CFTRI, said that milling was an important aspect of the national economy. He anticipated a great increase in the role of milling and processing in the food supply system of the future and said that a need would arise for increasing the flour milling capacity in the country to enable fuller utilization of the increased production of wheat, which, according to futurologists, would be about 57 million tonnes by 2000 A.D.

Shri M.K. Panduranga Setty, Chairman, Roller Flour Millers Federation of India, who also spoke on the occasion, said that an international school for milling technology would soon be established at CFTRI with Swiss collaboration to train personnel from flour milling industry.

Shri S.R. Shurpalekar of CFTRI was the coordinator of the course.

Course on Administrative Management in R&D

A ten-day course on Administrative Management in R&D was organized at the National Chemical Laboratory (NCL), Poona, from 7 June 1978. The course was designed to provide knowledge of modern management concepts relevant to the administrative field and provide awareness of the role of an administrator in an R&D institution. It also aimed at critically examining the appropriateness of the existing administrative system in a national laboratory.

In order to achieve these objectives the following broad areas were covered by the course: (i) Organizational development; (ii) Personnel management; (iii) Organization and methods; and (iv) Functional management areas like finance, materials, legal aspects and administration.

The course was inaugurated by Dr B. D. Tilak, Director, NCL. The participants brought to the fore the basic constraints under which a

laboratory works — constraints which arise from financial limitations, absence of a uniform system of personnel management and grievance handling, and several other factors. The basic message of the course, i.e. intensification of the process of self-introspection (know yourself : your strength and weakness — set examples through your behaviour and change through patient persuasion the attitude of your colleagues whom you supervise, and motivate them to think and act objectively), was driven home with each participant at the course.

Discussions also took place on manpower planning, records management, purchase and financial procedures, delegation of power and organization of welfare measures for the laboratory staff.

The participants evaluated the programme and made some interesting observations. They agreed that learning of rules and regulations were very important from the point of view of discharging duties, but the primary factor in optimizing their role was to build up definite attitudes, open one's mind, nurture a definite value of self-criticism, and imbibe the habit of objectivity.

Conference Briefs

Prof. B.K. Bachhawat, Director, Indian Institute of Experimental Medicine, Calcutta, participated, as a delegate of the Indian National Science Academy, in the Fifth Indo-Soviet Symposium on Chemistry of Natural Products held at Eravan, Armenia (USSR), from 10 to 22 May 1978. The symposium was organized by the USSR Academy of Sciences. Prof. Bachhawat gave a talk on 'Lectins as tools for the studies on glycoconjugates'.

Prof. Bachhawat also visited a few research institutions including She-myakin Institute of Chemistry of Natural Products of the USSR Academy of Sciences, and had discussions on various scientific matters of mutual interest.

Deputation Briefs

On being awarded a research training grant of the World Health Organisation, Dr Kartar Srivastava of the Central Drug Research Institute, Lucknow, worked with Prof. Birger Astedt at the Fertility Laboratory, Malmo Allmanna Sjukhus, Malmo, Sweden, from 22 October 1977 to 22 April 1978. At this laboratory Dr Srivastava studied the *in vitro* histochemical methods for identification of fibrinolytic activity of tissues and fibrin plates for fluids. He also underwent training in the various techniques of gel filtration, affinity chromatography, immuno-electrophoresis, crossed immuno-electrophoresis, polyacrylamide gel electrophoresis and tissue culture.

Dr Srivastava's studies on the use of progestasert ® (progesterone-loaded IUD) in human subjects showed that

this substance does not enhance the fibrinolytic activity of the endometrium. It can, therefore, be used in a wider scale without any potential danger of haemorrhage after insertion. He also worked on another angle of the problem—incorporation of fibrinolytic inhibitors like ε-aminocapric acid and tranexamic acid in IUD. The study proved that although such substances produce a 100% reduction in haemorrhage they increase the fertility potential, thereby defeating the original purpose.

Of the other fibrinolytic inhibitors, the Indian plant Punarnava (*Boerhaavia diffusa*) showed 100% antifibrinolytic activity in *in vitro* system of fibrin plates. A 50% freeze-dried alcoholic extract of this plant was 100% effective in inhibiting the plasminogen activity. It also inhibited urokinase, the enzyme known to enhance the fibrinolytic activity.

CULTIVATION AND PROCESSING OF ALGAE FOR FEED AND FOOD

L.V. Venkataraman*

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The importance of identifying a newer protein source needs no emphasis in view of the ever-increasing world population. Several unconventional proteins, like oilseed proteins, fish protein concentrate (FPC), leaf protein concentrate (LPC), and single-cell protein (SCP), are receiving worldwide attention. SCP includes protein from microbes like bacteria, yeast, fungi and algae. One of the efficient natural methods of converting the plentiful solar energy into food by a photosynthetic system is demonstrated by algae.

The use of algae as human food is known since centuries. Algae formed a part of the diet of the natives of the Lake

Chad in Africa and were also used by the Aztecs in Mexico. The last two decades have seen an increasing interest amongst the scientists of USA, Japan, France, Czechoslovakia, Germany and Israel in developing systems to exploit the algal productivity. The green algae *Chlorella pyrenoidosa*, *Scenedesmus acutus* and *Coelastrum proboscidium*, and the blue-green alga *Spirulina platensis* have well-established cultivation processes.

Algal cultivation set-up at CFTRI: Under an Indo-German agreement a pilot-plant scale algal project was started at the Central Food Technological Research Institute (CFTRI), Mysore, in 1973. The alga used in the study was the green alga *Scenedesmus acutus*. The project was handed over to CFTRI on behalf of the Government of India in 1976. Presently, the work on this alga and another blue-green alga *Spirulina* is being carried out under the All-India Coordinated

*Dr Venkataraman is the Scientist-in-Charge of the Algal Project at CFTRI. Other members of the project are: Shri P.K. Ramanathan (project coordinator), Dr B.P. Nigam, Shri S. Sivashankar, Shri C.R. Vinayaka, Miss M. Anusuyadevi and Shri T. Rajasekaran.

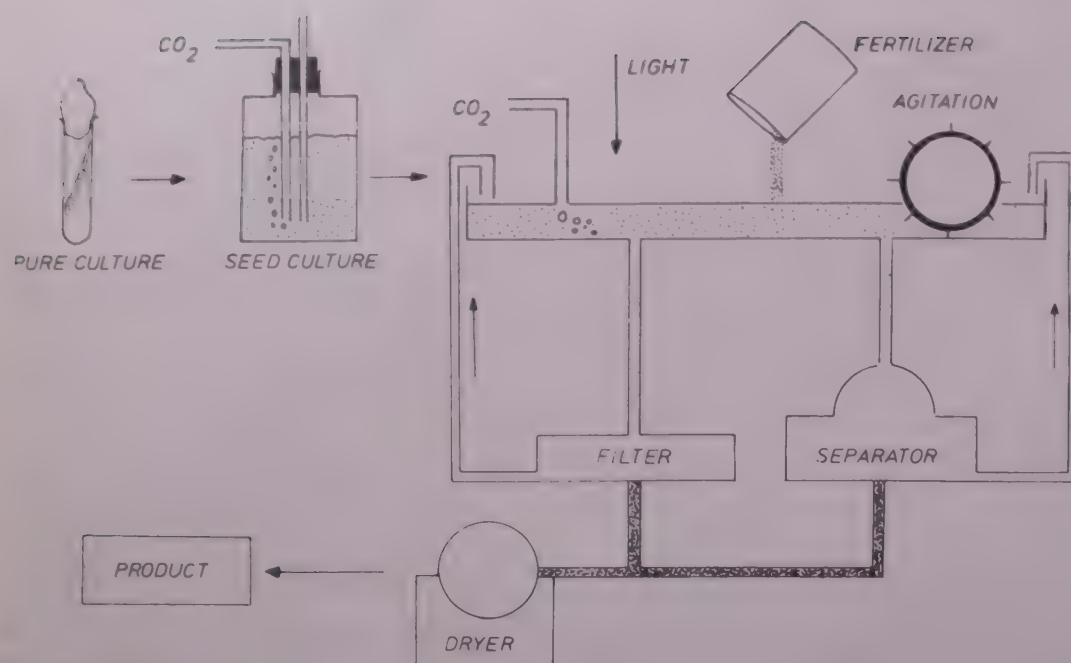


Fig. 1 Process flow-diagram for algal cultivation:CFTRI

Project on Algae (AICPA). Sponsored by the Department of Science and Technology, AICPA is a multi-institutional project concerned with the utilization of algae as biofertilizer, source of protein, fuel and as a component in an integrated recycling system. The institutions collaborating in this national-level project are CFTRI; National Environmental Engineering Research Institute (NEERI), Nagpur; Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar; Auroville Centre (AC), Pondicherry; Indian Agricultural Research Institute (IARI), New Delhi; National Institute of Nutrition (NIN), Hyderabad; and Indian Veterinary Research Institute (IVRI), Izatnagar. CFTRI is carrying out work on the cultivation of clean-water algae for use as feed and food. NEERI is concerned with the utilization of sewage-water algae; and CSMCRI, with marine algae as food, feed, fertilizer and biogas. AC and IARI are paying attention to the use of algae as feed and fertilizer, and as biofertilizer respectively. NIN and IVRI are evaluating algae as feed and food.

Cultivation conditions: Cultivation of algae is similar to agricultural methods used for crops excepting that the growth

is faster and the crop is in a liquid medium. The major steps in the cultivation of algae are shown in Fig. 1, and these include preparation of inoculum, and mass outdoor cultivation, harvesting, centrifuging and drying. The algal culture is to be supplied with a suitable fertilizer mix

and urea. The growth, and consequently the yield, of algae depends on the selection of a suitable carbon source. Carbon dioxide from industrial wastes or from gas cylinders is ideal when the algae are grown autotrophically as in the case of *Scenedesmus*. This alga can also be grown mixotrophically by using both carbon dioxide and molasses, the latter being a byproduct of sugar industry. For the cultivation of the blue-green alga *Spirulina*, bicarbonates are supplied as the carbon source. Agitation of algal cultures is necessary to provide uniform light and uniform supply of fertilizers to the cells and this also prevents flocculation. At CFTRI, motor-driven paddle wheels are used for agitation.

Cultivation tanks: The present cultivation at CFTRI consists of PVC tanks of different sizes as shown in Fig. 2. The smallest tank has a surface area of 5m^2 and the largest 55m^2 , with volumes of 500 and 1000 litres respectively. The total cultivation area is around 240m^2 . Instead of PVC tanks, simple cement tanks with suitable gradients for flow of cultures can also be used.

Under optimal conditions, the algal



Fig. 2 An overview of algal cultivation tanks at CFTRI

cultures are ready for harvesting in about 5-6 days when they can be processed. The outdoor algal cultures may be run both as continuous cultures or batchwise depending on the type of algae used and the weather conditions.

Harvesting: *Scenedesmus* cells are small (5-8 μm), and therefore, the concentration is to be effected by centrifugation. This is done by using a centrifuge separator. It is also possible to concentrate the alga by using flocculents like alum, lime, chitosan or cationic polymers, or by flotation. When the algal cells are larger, as in *Spirulina* (100 μm), they can be filtered by using ordinary cloth on a filter stand.

Drying: The dark-green algal sludge of *Scenedesmus* is sprayed on the drum drier at 120°C. The residence time on the drum for drying is about 10 sec. This drying process ruptures the cell wall, making the valuable protein digestible, besides sterilizing the final product.

Drum-drying is an efficient process for breaking the cell wall of the algae if they are intended for human nutrition. If required for cattle feeding there is no need to drum-dry the algae since the ruminants have cellulase, an enzyme which can hydrolyze the cellulosic cell wall of algae. Hence the concentrated algae slurry can be either de-watered into wet cakes or sun-dried into powder for use as cattle feed. This step minimizes the cost of production.

As the cell wall of *Spirulina* is thin, the alga can be sun-dried by spreading the algal slurry on thin plastic sheets exposed to sunlight. The dried algal powder can be used in feed or food.

At CFTRI, the feasibility of sun-drying *Scenedesmus* is being investigated. At Auroville Centre, *Chlorella* is sun-dried and evaluated as cattle feed. It is also possible to use solar heaters for drying the algae. The practicability of these processes is yet to be established.

Algal productivity: The algal yield (dry matter) under optimal conditions is 15-20 g m² day. A more practical projected estimate based on the pilot-plant study

is about 60 tonnes/ha/annum on dry-weight basis. It is possible to increase the yield to 70-75 tonnes under defined conditions. The advantage of algae is not primarily the absolute yield of dry matter but the yield of protein which is much higher compared to that from other agricultural crops.

Composition and nutritional value of algae: The major component of algal biomass is crude protein which is of a good quality and accounts for nearly 50-60%. Besides, it is rich in B complex vitamins, particularly vitamin B₁₂ (cobalamine), which is not common in plant products. The dried algae are of intense green colour and are grassy in taste.

Several methods are available for extraction of pigments or for preparation of protein concentrates. But, these are not used since they lead to loss of nutritional value, vitamins, minerals and lipids. Besides, the processing cost will be high. Algae are totally edible and can be introduced as a part of many conventional foods. Nutritional and preliminary toxicological tests carried out at CFTRI and elsewhere have been very promising.

Cost: The algal technologies available from developed countries are similar to the technology used at CFTRI and are capital-intensive, involving considerable inputs of electrical energy. The cost of algae produced in such plants is about three times more than that of the oilseed proteins. There is considerable scope to reduce the cost of production by elimination or modification of centrifugation of algal cultures and of drying by expensive drum drier. Efforts are being made to simplify the methods of production and processing of algae to suit village-level installation and to utilize them as poultry or cattle feed. An integrated system can be evolved by combining algal cultivation and poultry and cattle farms.

Though clean-water cultivation of algae is carried out at CFTRI for ultimate use of algae as supplementary protein for man, it is possible to

cultivate algae in sewage effluents for use as feed. The cost for such an enterprise will be considerably lower. Work on these lines is in progress at NEERI.

Acceptability: The immediate prospect of using algae as a cattle and poultry feed is being explored. Experiments carried out on animals indicate no serious problems of acceptability. But, although the use of algae as a supplementary protein for meeting the human needs is promising, this cannot be achieved in a short time since it involves sociological, cultural, economic, political and other considerations. India is a country with varied established food habits. For general acceptance promotional efforts are to be made with suitable algal products which can be produced at reasonable cost.

PROGRESS REPORTS

CGCRI Annual Report: 1976

The annual report of the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, for 1976 shows that the R&D activities of the institute were spread over 55 applied research projects, including four sponsored and collaborative projects and four objective basic research projects. Laboratory investigations on two projects were completed. Four processes, viz. (i) bloating type refractories for casting pits of steel plants; (ii) foam glass; (iii) glass-ceramic tiles for lining coke-oven chutes; and (iv) lithium carbonate from indigenous lepidolite, went into commercial or trial production.

The CGCRI extension centre at Naroda (Gujarat) was organized to undertake chemical analysis and evaluation of glass and ceramic raw materials and to render technical assistance to industry. The CGCRI unit in the CSIR Complex at Trivandrum started work on the evaluation of ceramic raw materials.

Work on the development of homogeneous arsenic trisulphide glass, needed by the Defence for production of

infra red devices, was completed on a bench scale

An important achievement during the year was the development of an indigenous low-cost technology for the production of fibreglass from commercially available C-type glass rods. The estimated cost of production by this process is nearly half that of commercial fibreglass and the material is suitable for making high-strength FRP products. A prototype unit for the production of glass fibres was under installation.

Under a DST-UNDP inter-laboratory project, 'E' glass composition suitable for developing fibres was developed; this melted in a tank furnace at 1480°C as compared to the conventional 'E' glass which melts at 1580°C.

YIG (yttrium iron garnet) single crystals of suitable size, used in the electronic industry for tuning and delay-line devices in the microwave and ultra-high frequency regions, were synthesized from doped $\text{PbO-PbF}_2\text{-B}_2\text{O}_3$ flux system. About 20 crystals in the size range 1-3 mm, grown in two long-term (5-6 days) growth runs in the same system, were processed by a mini-grinder designed in the laboratory to 0.25 to 0.75 mm diam. spheres with a sphericity tolerance of ± 0.10 mm. Visually perfect single crystals of gadolinium iron garnet (GdIG) in the size range 2-6 mm were also synthesized in the same flux system. YIG crystals of various sizes ranging up to 5 mm were also synthesized from flux systems $\text{Na}_2\text{O-B}_2\text{O}_3$, $\text{NaF-B}_2\text{O}_3$ and $\text{PbO-NaF-B}_2\text{O}_3$.

High-purity reactive alumina with very low soda content and suitable for making electronic-grade ceramic components was developed and about 150 kg of the material of superground variety wherein 87% of the particles have sizes finer than $2\text{ }\mu\text{m}$ was prepared. The pressed buttons using more than 99% of this alumina, when fired at 1600°C for 4 hr, showed a shrinkage of about 17.1%, soda content of 0.03%, and zero porosity.

Suitable compositions sinterable at 1550-1600°C in 4 hr, along with the requisite fabrication techniques, were standardized for a moderately surface-finished alumina substrate. The samples of the substrate were being evaluated at the Indian Institute of Technology, Delhi. A special inorganic polyelectrolyte suitable for imparting excellent slip casting quality to the reactive alumina was also developed.

The institute prepared abrasion-resistant tiles utilizing waste cupola slag and phosphorus plant slag. Studies carried out at CGCRI have shown that phosphorus plant slag could be utilized for making amber glass containers and also as a flux in melting and refining of glass, resulting in the lowering of melting temperature by about 50°C and substantial saving in fuel consumption.

Reaction-bonded silicon nitride, an important refractory material possessing high hardness, high strength at ordinary and elevated temperatures and unique thermal shock resistance, developed earlier at CGCRI, has been found to have extremely high corrosion resistance towards molten non-ferrous metals like aluminium, zinc and lead. It could also resist corrosion by molten copper under reducing conditions. Thermal shock tests carried out on low-porosity silicon nitride indicated no failure in 100 cycles of heating and cooling from 1200°C to room temperature.

For producing silica glass (96%), a technique had been developed earlier at the institute for accelerating the melting and homogenization of the parent glass. Utilizing this technique, tubes and plates were fabricated from meltings of

$\text{Na}_2\text{O-B}_2\text{O}_3\text{-SiO}_2$ glass. The products were heat-treated, leached and sintered with a view to optimizing the process parameters. U-tubes for thermocouple cartridges made from the glass were tested at TISCO and were reported to have successfully withstood the temperature and ferrostatic pressure of the molten steel bath. This glass was also found suitable for use as UV transmitting material. Tests were being carried out to determine its suitability for making carbon-impregnated resistors and Refrasil type silica fibre.

A process for the regeneration of waste plaster of Paris was worked out on a laboratory scale. The regenerated material was not only comparable in quality to the commercially available plaster of Paris but also had higher dry and wet strength.

Investigations carried out in collaboration with the Directorate of Mines and Minerals of the Government of West Bengal indicated that samples of china clay from Makdumnagar sector of Birbhum district were suitable for making sanitarywares and tiles for which fixed colour of body was not of prime consideration.

Technical assistance was rendered to about 200 parties including government organizations for starting new glass and ceramic factories, setting up of control laboratories, evaluation of raw materials and products, improving methods of production and increasing productivity, preparation of feasibility reports, etc. Furnace designs were supplied to three parties and technical assistance in improving the performance of furnaces was given to several plants.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Hundred-Channel Data Logging System

The National Aeronautical Laboratory (NAL), Bangalore, has developed a data logging system which accepts information in the form of millivolt/microvolt signals from strain

gauges (4- or 6-wire input), thermocouples, pressure transducers (2-wire input), etc. The analog input signal is digitized, displayed on the front panel, and printed punched on the output peripheral.

The scanner scans the input signal

and connects it to the analog-to-digital (AD) converter through a suitable signal conditioner. The AD converter digitizes the analog input, and the digital equivalent is displayed on the front panel. The BCD output from the AD converter is converted into a code suitable for the output peripheral. The translated output is serialized and connected to the output peripheral which prints/punches the data in the required format.

The data logging system mainly consists of a scanner, a signal conditioner, an AD converter, a serializer and output peripheral drive, a bridge balancing system (optional), and a linearizer (for thermocouple inputs) (optional).

The scanner (10-1000 channels) provides 2-wire (20 channels/sec.) or 4-wire (10 channels/sec.) input channels of floating input signal. All input is through screw-type terminals. The scanner includes a programmer providing a manual mode and an auto mode for operation. In the manual mode, it is possible to select any one channel for display and optional printing/punching. In the auto mode, scanning of channels is done at a maximum rate of 2 sec./channel. Starting of channels is done by actuating the push-button marked 'Start Data Read'. In both modes the selected channel is displayed on the front panel.

In the auto mode, facilities are provided for the following modes of operation: (i) Auto single scan — In this mode, scanning is cyclic, i.e. it starts from the first channel and stops at the last channel; (ii) Auto continuous scan — In this mode also scanning is cyclic, it starts from the first channel and recycles without stopping; (iii) Limited single scan — In this mode, scanning is done from any one channel to any other channel both being selectable on the front panel; and (iv) Limited continuous scan — In this mode, scanning is as in limited single scan but cyclic.

The output of the scanner is connected to the signal conditioner unit and the signal is amplified and

standardized to get the desired accuracy. The long-term stability of the signal conditioner is $\pm 10 \mu\text{V}$. The output of the signal conditioner is connected to the AD converter. On command from the scanner, the AD converter reads the output from the signal conditioner and presents it on a four-digit decimal display with polarity on the front panel. The BCD output from the AD converter and channel identification information from the scanner are translated into a code suitable for the Hindustan teleprinter (or other devices). The translated output is serialized and connected to the teleprinter through suitable drive circuits.

The printing format on the teleprinter is: 25+1325—0. The first two digits indicate the channel selected, followed by polarity and data. The position of decimal points is printed last after a dash.

The bridge balancing system (optional) provides half bridge, half bridge with common dummy, and full bridge configurations. It has a balancing potentiometer for every channel. A 10-turn wire-wound potentiometer is used for balancing. In addition, this unit has a highly regulated dc excitation supply for strain gauges (resistance, 120-1200 ohms). The gauge factor adjustment provided in each module is adjustable from 1.7 to 2.2.

The linearizer for thermocouple inputs (optional) linearizes the input signal and provides necessary correction for the non-linearity of thermocouples so that the digital output represents the correct temperature.

The system is complete with necessary regulated power supplies for its logic and drive circuits.

Other specifications of the system are:
Mains supply: 230 V $\pm 10\%$ 50 Hz ac single phase

Bridge balancing system

Excitation supply	: 5V $\pm 0.05\%$ at gauge factor of 2
Gauge factor range	: 1.7 to 2.2 (varies bridge excitation supply) one control per module of 10 or 20 channels

Zero balance range	: Approximately ± 3000 microinches inch on all gauge resistance setting
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Analog-to-digital converter

Input	: 1.999 mV and 19.99 V bipolar input
Resolution	: 1 μV (on 1.999 mV range)
Accuracy	: $\pm 0.1\%$ of full scale ± 1 count
Input impedance	: 300 megohms differential 1000 megohms common mode
Common mode rejection	: 110 dB
Conversion time	: 20 ms
Data output	: BCD output with polarity indication
Display	: Sharp bright display with attractive coloured filters
Mains input	: 230 V ac 50 Hz

Signal conditioner

Common mode input impedance	: 300 megohms
Differential input impedance	: 1000 megohms
Drift: vs temperature	: $\pm 0.5 \mu\text{V}/^\circ\text{C}$
vs time	: $\pm 10 \mu\text{V}/\text{month}$
Common mode rejection	: 110 dB
Supply voltage	: ± 15 V nominal

The system requires code converter drive units for output peripheral like teleprinter, paper tape punch, on-line printer, etc. These units accept BCD input from the AD converter and scanner and convert it into a suitable code depending on the output peripheral. Further, the data are serialized based on the printing/punching format required and given to the output peripheral through suitable drive circuit.

The laboratory has developed several data systems to customer specifications and supplied to various organizations like SERC, Madras, and Roorkee; University of Roorkee; RDSO, Lucknow; VSSC, Trivandrum; and DLRL, Hyderabad. The performance of the systems has been found satisfactory.

The estimated demand for the data logging system is about 20 units per annum. The main components required are ten-turn potentiometer, six-contact changeover relay, integrated circuits,

instrumentation amplifier, digital panel meter, teleprinter, power supply, rack connector, rotary switches, capacitors, resistors, PC cards and connectors. All these excluding some integrated circuits and the instrumentation amplifier are available indigenously. The value of imported components amounts to about Rs 10,000 per unit.

The main test instruments required are oscilloscope, multimeter, digital voltmeter and voltage standard. Except for the voltage standard all are available indigenously.

Owing to relatively low turnover it is suggested that production should be taken up by those firms which have the background, experience and standing in the production of data logging systems.

The techno-economics of the product as suggested by NAL for an economically viable unit (10 systems per year) is: fixed capital on equipment, Rs 1,00,000; and working capital, Rs 3,25,000. The cost of the system comes out to Rs 90,000.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PERSONNEL NEWS

Appointments/Promotions

Dr S.D. Khanduja

Dr S.D. Khanduja, Scientist C, National Botanic Gardens (NBG), Lucknow, has been appointed, on merit promotion, Scientist EI at NBG with effect from 3 May 1978.

Dr Khanduja (born 19 April 1934) has had a brilliant academic career at the Poona University wherefrom he obtained his B.Sc. (agriculture) and M.Sc. (agriculture) degrees in 1952 and 1955 respectively. He won K.D. Patil Krishi Medal for outstanding merit in agriculture.

Dr Khanduja, who joined NBG in April 1958 on transfer from the National Chemical Laboratory, Poona, worked with Academician Dr S.A. Melnik at the Odessa Agricultural

Institute (USSR) during 1962-1965 on a government scholarship, and obtained his Ph.D. degree for research on enhancing fruitfulness of buds in Pinot Gris grapes. On his return, Dr Khanduja organized the viticultural laboratory to study the reaction of *vinifera* grapes to the subtropical climate of North India.

A pioneer in viticultural research in the country, Dr Khanduja has worked on problems related to advancing maturation, forecasting and increasing fruiting potential, improving fruit quality, determining fertilizer requirements and controlling physiological disorders of vines. He and his colleagues have developed a method of breaking dormancy of buds in the field by thiourea, thereby advancing the ripening of berries. The breach in dormancy has been shown to be associated with early appearance of two new isoperoxidase enzymes in thiourea-treated canes. On the basis of a long-time fertilizer trial, and bloom-time petiole analysis of high-production vineyards, he has established nutrient concentration standards for evaluation of the nutritional status of vines. Other significant contributions of Dr Khanduja and his associates relate to control of inflorescence drying with foliar sprays of chloride salts of calcium and magnesium, increasing fruitfulness of Thompson Seedless vines with uracil, forecasting bud fruitfulness by pruning the selected canes after the harvest of the crop in June and improving the quality of Gulabi grapes with Ethephon.

Dr Khanduja visited various viticultural research institutes in West Germany, during July-October 1972, under the CSIR-DAAD exchange programme. He worked at the Federal Research Institute for Vine Breeding at Geilweilerhof on berry maturation under the influence of Ethephon.

Dr Khanduja has more than 30 papers to his credit.

Dr V.R. Balasubrahmanyam of

NBG, Lucknow, has been appointed, on merit promotion, Scientist B (3 May 1978).

Shri M.V. Viswanathan has been appointed Scientist B at the Publications & Information Directorate, New Delhi (1 July 1978).

Shri T.S. Sodhi, Administrative Officer (Grade II), National Physical Laboratory, New Delhi, has joined, on promotion, the Indian National Scientific Documentation Centre, New Delhi, as Administrative Officer (Grade I) (1 Aug. 1978).

Shri Khanna Retires

Shri O.P. Khanna, Deputy Secretary, CSIR Headquarters, New Delhi, retired on 31 May 1978. Shri Khanna, who joined CSIR in 1940, worked in various capacities in the CSIR Headquarters and some of the national laboratories.

Science News Service

Proceedings of Seminar

The proceedings of the seminar on Science News Service (Calcutta, 11-12 March 1978) organized by the Indian Science News Association (ISNA), Calcutta, in collaboration with CSIR and DST [CSIR NEWS, 28(1978), 50] have been published recently by ISNA.

NEERI Publications

Environmental Pollution Control: A Select Bibliography

Compiled by A.M. Khan, S.K. Kesarwani & S.G. Bhat

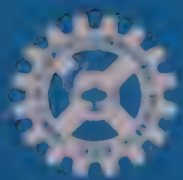
Pp. 386; Price, Rs 28 + Rs 4 for postage (in India) and \$ 14 or £ 7 including postage (foreign)

Indian Literature in Environmental Engineering: Annual Bibliography

Compiled by S.K. Kesarwani, (Smt.) S.N. Sinnarkar & S.G. Bhat

Pp. 292; Price Rs 20 + Rs 4 for postage (in India) and \$ 10 or £ 5 including postage (foreign)

These publications can be had from the Director, National Environmental Engineering Research Institute, Nagpur 440020.



Underwater Copper Resistance Thermometer

An underwater copper resistance thermometer has been developed by the National Institute of Oceanography (NIO), Goa. The thermometer is capable of measuring the temperature (range, 0°-40°C) of sea-water up to 500 m depth. It can be used in conjunction with an electrode (conductivity meter) for determining the salinity to an accuracy of 0.05 ‰.

The thermometer comprises a loop of a fine-gauge synthetic-enamelled copper wire in a helically-wound, small-diameter stainless steel tube. The tube is filled with transformer oil to give insulation as well as conduction. The copper leads are brought out through a



Underwater copper resistance thermometer developed by NIO

hole in the stainless steel holder for making connections. To ensure that leads do not affect the sensing unit, the thermometer is connected as a four-wire device (two current leads, two potential leads).

Differential Tinplate for Canning Food Products

The electrolytic tinplate was developed during the second world war to replace hot-dipped tinplate as a tin conservation measure in the manufacture of the cans used for canning food products. Cans made from these electrolytic tinplates carried the same thickness of tin on the inner and the outer sides of the container. Later, 'differential tinplates', i.e. electrolytic tinplates having different thicknesses of tin coating on the inner and the outer sides, were developed and these found wide use in the developed countries. Presently, in India, an electrolytic tinplate with a tin coating of 1 lb per base box (one base box = 112 sheets of 20 in. × 14 in.) equally coated on both sides is being used for canning food products. If the differential tinplate with reduced thickness of tin coating on the external surface of the can is introduced in the canning industry, it would be possible to save about Rs 25 lakh in foreign exchange annually.

Experiments undertaken at the Central Food Technological Research Institute, Mysore, to find the optimum thickness of tin coating required externally under Indian atmospheric conditions indicated that cans fabricated from the electrolytic tinplate with a tin coating of 0.25 lb per base box were not suitable under humid conditions like

those in Bombay. However, cans with a tin coating of 0.5 lb per base box with lacquer or lithograph, and plain cans with a tin coating of 1 lb per base box showed satisfactory results.

At present differential tinplates are being imported from other countries. In India, facilities for the manufacture of differential tinplates are available at the Rourkela Steel Plant.

Fluidized Bed Boiler Installed at RRL, Jorhat

A 2 tonnes/hr steam generating capacity fluidized bed boiler has been installed at the Regional Research Laboratory (RRL), Jorhat. The boiler will help carry out studies on the combustion characteristics of coals of the north-eastern region and the data obtained will be utilized for designing and fabricating package boilers of different capacities with the ultimate aim of making boilers for thermal power production.

The laboratory has been carrying out R&D work on fluidized bed combustion of high-sulphur coals on a laboratory scale since 1974.

Investigations made on coals from Assam and Meghalaya yielded satisfactory results, and as a result, the laboratory designed and fabricated a small unit capable of burning 20 kg/hr of high-sulphur coals. The 2 tonnes/hr boiler, installed now, has been designed and fabricated by the Bharat Heavy Electricals Ltd, Tiruchirapalli, on the basis of data supplied by RRL, Jorhat.

The boiler was inaugurated by Shri L.P. Singh, Governor of Assam, Manipur, Meghalaya, Nagaland and Tripura, on 31 May 1978.

Synthesis of Some Sesquiterpenes

Shri V.K. Belavadi, a CSIR junior research fellow, who worked under the guidance of Dr S.N. Kulkarni of the National Chemical Laboratory, Poona, synthesized (+)-epizonarene from (-)-menthone. The synthesis consisted in the preparation of 7-isopropyl-10-methyl-4-oxobicyclo[4.4.0]dec-5-ene through Mannich base from (-)-menthone, formaldehyde and dimethylamine followed by quaternization and reaction of ethyl sodioacetoacetate. The ring-juncture stereochemistry was found by circular dichroism data. Reaction of the conjugated ketone with methylmagnesium iodide followed by dehydration gave (+)-epizonarene along with two other homoannular dienes which were separated by chromatography.

Shri Belavadi also studied the stereochemical disposition of the isopropyl group of the above conjugated ketone, which could be obtained in the form of liquid as well as solid. It was found that the solid ketone was pure and the liquid ketone was a mixture of two isomers in 80:20 ratio. The solid ketone and the major component in the liquid ketone had the same stereochemical structure but differed in their NMR at C₁₀-methyl signal and in rotation. The difference has been assigned to the conformation of ring B of the conjugated ketone.

The natural product 7-hydroxycadalenal (3-formyl-5-isopropyl-8-methylnaphth-2-ol) was synthesized as follows: Carvotanacetone was converted through two routes to the extended conjugated ketone 1-methyl-4-isopropyl-5(3-oxobutyl)cyclohex-2-ene, which was cyclized to the dienone 7-isopropyl-10-methyl-3-oxobicyclo[4.4.0]deca-1,9-diene. This was formylated and dehydrogenated with a quinone, giving a mixture of 7-hydroxycadalenal and a dihydro derivative. The dihydro derivative on catalytic dehydrogenation gave 7-hydroxycadalenal.

For his thesis based on these studies, Shri Belavadi has been awarded the Ph.D. degree of the Poona University.

Conference Briefs

Dr P.M. Bhargava, Head, Centre for Cellular and Molecular Biology at the Regional Research Laboratory, Hyderabad, attended the 1978 Gordon Research Conference on Theoretical Biology and Biomathematics held in Tilton, New Hampshire, USA, during 20-24 June 1978. The conference, which was devoted to the various aspects of regulation of eukaryotic cell behaviour,

was attended by 90 participants. One of the four invited participants from outside USA, Dr Bhargava presented a paper on 'Nutrition, membrane function and cell division'.

Dr Bhargava had a brief discussion with Prof. (Mrs) Annamaria Torriani-Gorini of the Massachusetts Institute of Technology, USA, with whom he has been carrying out a collaborative research programme. During his stopover at Frankfurt, he had discussion with Prof. Karl-Heinz Scheit, with whom also he has been investigating a collaborative project on seminalplasmin.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

High-Current Potentiostat

The National Aeronautical Laboratory (NAL), Bangalore, has developed a high-current potentiostat consisting of two units, viz. a low-power potentiostat and a power booster. The potentiostat is protected against short circuiting for an indefinite period and is capable of delivering the full current into a load of a few milliohms. Its circuitry is such that the output can be driven from negative to positive through zero without cross-over distortion. As a consequence, this instrument can be used for impressing on an electrode a voltage waveform that may take an excursion through zero, e.g. sinusoidal, triangular and square waveforms.

The design of the instrument fabricated is such that it can be used in two modes: (i) low-current high-voltage, and (ii) high-current low-voltage.

The low-current high-voltage mode can be used for determining corrosion rate and for studying mechanisms of corrosion and its protection. It can also be used for studying electrode kinetics, mechanisms of electrode reactions and anodic passivation of metals and alloys.

The high-current low-voltage operation finds applications in controlled potential electrogravimetric analysis of

metals, alloys, plating baths and inorganic compounds; controlled potential electrolytic separation of interfering elements in analysis; laboratory investigations relating to electroplating, anodization, battery technology, electrolytic preparations of chemicals, and anodic protection of metals and electrolytic thinning of metals and alloys required for electron microscopy.

The potentiostat developed at NAL has the following specifications:

(i) Low-current high-voltage mode

Output voltage	: ± 20 V
Output current	: ± 500 mA
Range of control potential	: ± 3 V
Stability	: better than ± 5 mV
Facilities available	: (i) external signal can be superimposed; and (ii) the unit can be operated as a galvanostat

(ii) High-current low-voltage mode

Output voltage	: ± 10 V
Output current	: ± 5 A
Range of control potential	: ± 3 V
Stability	: better than ± 10 mV

The unit operates on 230 V, 50 Hz, ac mains.

The laboratory has fabricated one prototype and has successfully tested it over a period of two years.

It is estimated that an economically viable unit should produce 30 potentiostats per annum. Such a unit

would require Rs 40,000 as fixed capital on equipment and Rs 38,000 as working capital. The cost of production per unit will be about Rs 5,000.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Silver Paste for Mica Capacitor Electrodes*

Silver paste is used in the production of mica capacitor electrodes. Mica capacitors are being produced in the country for use both in entertainment equipment like radio and television receivers and amplifiers and professional equipment like communication systems. The electrode material in the form of paste facilitates the application of screen-printing techniques which are being employed presently by capacitor manufacturers. The glass in the paste forms a matrix for conducting metal particles and this facilitates firm binding with mica substrate. The demand for the product in the country is not known precisely. These pastes are not being manufactured in the country and the entire demand is met through imports.

The National Chemical Laboratory, Poona, has developed a process for the manufacture of silver paste. In this process, silver, precipitated from its soluble salt, is intimately mixed with a low softening glass and is processed with a highly viscous mass prepared from an organic filler and solvents to give the paste. It is paint-like in consistency. The yields are quantitative. The laboratory investigations have been carried out on a scale of 1 kg of silver paste per batch.

The product has the following specifications:

Drying time	: 10-15 min. at 150°C
Firing temp.	: 600°C (peak)
Time at peak temp.	: 6 min.

*The process for the manufacture of silver paste for mica capacitor electrodes has been released recently to Ramans (India), Ambala, through NRDC.

Conductivity	: 0.02-0.06 ohms/sq
Rheology	: Thixotropic
Thinner	: Butyl cellosolve
Adhesion	: Good on mica

Tested by a firm in Bihar the product was found suitable for screen-printing.

The raw materials required for the manufacture of silver paste are silver nitrate, acetone, sodium hydroxide, an organic filler, a reducing agent, glass, and a pine oil component. All these chemicals are of CP grade and are indigenously available.

Stainless steel vessel jacketed 60-litre glass beakers, a plastic vessel, a porcelain Buchner funnel, porcelain ball mills (3 to 5), a drying oven, and a paint mill are the major items of plant and

equipment. All these are available indigenously.

According to the laboratory, the minimum economic capacity of a plant would be 1 tonne/annum. The total capital outlay for a plant of this size has been estimated at Rs 6.27 lakh (Rs 1.10 lakh for land, building, and plant and equipment; and Rs 5.17 lakh as working capital). The cost of production comes to about Rs 1670/kg as against the present market price of about Rs 2000/kg.

Further particulars may be obtained from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

CSIR SUPPORT TO RESEARCH

Measurements of Beta Particles Absorption and Photoionization Cross-Sections

Controversy about the dependence of absorption of beta particles on the atomic number (Z) of the absorber prompted Shri C. Ranganathaiah (a CSIR junior research fellow), who worked in the Physics Department of the University of Mysore, to study the absorption of various energetic beta particles in different elements. Absorbers of aluminium, copper, silver, tin, gold and lead and beta particles with end-point energies of 430, 765, 1170 and 1700 keV from ^{185}W , ^{204}Tl , RaE and ^{32}P were used for this purpose. A well-type plastic scintillation detector (Ne 102) assembled with a single-channel spectrometer was used for detecting beta particles.

The fraction of the beta particles that was transmitted through a foil was measured by keeping the source at 2.2 cm from the detector with absorber foils placed in between the two. The experiment was repeated for varying thicknesses of the absorber foil. In all the cases the maximum thickness was limited to 0.4 times the range of the beta particles, as the absorption is known to obey exponential law in this range. The

mass absorption coefficients μ were determined by the method of least squares. It is known that μ depends primarily on incident beta end-point energy E (in MeV) and also to a lesser extent on the atomic number (Z) of the absorber. So, the relation for μ can be of the type $\mu = KE^a Z^b$, where K , a and b are constants, which can be evaluated using the values of μ determined experimentally. With these values of constants so evaluated, Ranganathaiah obtained an empirical relation for the mass absorption coefficient μ as $\mu = 0.0061 E^{-1.23} Z^{0.366E-0.069}$.

This relation is useful in determining the absorption of beta particles in different target materials in the energy range 100-3000 keV.

Ranganathaiah also carried out some atomic photoionization cross-section measurements. Using the method of Gowda and Sanjeevaiah, who fitted a Gaussian to the main photoelectron peak to derive the K-shell photoelectric cross-sections, Ranganathaiah measured the total and K-shell photoelectric cross-sections for 323-keV gamma rays in copper, zirconium, silver, tin, tantalum, gold and lead. The main source of error in this method is the subtraction technique and statistical uncertainty. Also, as the incident

gamma ray energy increases above a few hundred kiloelectron volts, the scattering process dominates over the photo-absorption. The target count rate was found to be less than the gamma background count rate and it became rather difficult to obtain true photoelectric events by the subtraction technique.

Values of K-shell cross-sections obtained from direct measurements made by a few experimenters were not free from errors and inconsistencies. More extensive and reliable measurements are needed to check the recent theoretical calculations. Hence, Ranganathaiah took up investigations with a preference to K-shell which contributes about 80% to the total cross-section. It was found that there were certain limitations and uncertainties in these methods. For the direct estimation of K-shell photoelectric cross-sections by observing the coincidences between the K X-rays (that followed the photoelectrons) and the photoelectrons, he assembled a plastic-NaI (TI) scintillation fast-slow coincidence spectrometer in conjunction with a 1024 multichannel analyzer to store the coincidence spectrum.

In this experiment, photoelectrons released during the interaction of gamma rays in the target element were detected by a flat circular plastic scintillator (Ne 102) and the K X-rays by a thin NaI (TI) crystal having a thin beryllium window. The target foil of element under investigation was punched to 1.98 cm diam. and was placed on the face of the plastic scintillator. The K X-ray detector was placed at 8.8 cm from the target and at $\pm 20^\circ$ with respect to the incident photon beam. The fast-slow coincidence assembly was of conventional type and permitted the detection of true photoelectric events by gating the K X-rays. An aluminium target of almost equal dimension instead of the target under investigation was used to correct the unsuppressed Compton contribution in the coincidence spectrum.

With these measurements, Rangan-

athaiah found that K-shell photoelectric cross-section σ_K is related to the number N_K of K X-rays by the relation $\sigma_K = N_K / NSw_K \Omega \epsilon_K$, where N is the total number of atoms present in the target foil, S is the gamma flux impinging on the target foil, w_K is the fluorescence yield, Ω is the solid angle subtended by the K X-ray detector at the target, and ϵ_K is the photopeak efficiency of the X-ray detector for K X-rays.

The number N_K was estimated by taking the total number of counts under the coincidence peak area and this was corrected for chance coincidence rate, self absorption in the target material and window absorption of the K X-ray detector. The corrected N_K was then used to calculate the K-shell cross-section.

The total number of atoms present in the target was estimated using the relation $N = mL/A$, where m is the mass of the target foil, L is Avogadro's number, and A , the atomic weight of the target material. The photon flux S was experimentally determined and Ω , the solid angle correction, was calculated, w_K values were taken from literature, and ϵ_K in this experiment was taken as unity since both the detectors were 100% efficient for the corresponding particles.

Ranganathaiah measured K-shell photoelectric cross-sections for 662-keV gamma photons in tin, tantalum, gold and lead targets by this method. A good agreement was found between these values and the theoretical ones.

Shri Ranganathaiah carried out these investigations under the guidance of Prof. B. Sanjeevaiah, Head, Physics Department, University of Mysore.

New Research Schemes

Eighty-nine new research schemes have been sanctioned by the Council of Scientific & Industrial Research for a period of two years. Following is the list, research committee-wise, of new research schemes sanctioned, along with the names of the investigators and the university departments/institutions.

Biochemical & Microbiological Research Committee

Structural characteristics of 50 S and 30 S ribosomes of *Escherichia coli*—DR D.P. BURMA, Molecular Biology Unit, Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University, Varanasi.

Quaternary structure and site heterogeneity in plant glyceraldehyde 3-phosphate dehydrogenase—DR O.P. MALHOTRA, Department of Chemistry, Banaras Hindu University, Varanasi.

Biochemical basis of genetic pleiotropism between antibiotic synthesis and cellular differentiation for sporulation—DR S.K. BOSE, Department of Biochemistry, Calcutta University, Calcutta.

Specificity of protein-nucleic acid interaction—DR S.K. PODDER, Department of Biochemistry, Indian Institute of Science, Bangalore.

Metabolic inactivation and regulatory functions of amines in the nervous tissue—DR A.S. BALASUBRAMANIAN, Neurochemistry Laboratory, Christian Medical College & Hospital, Vellore.

Studies on biodegradation and biosynthesis of neem gum—DR T.N. PATTABIRAMAN, Department of Biochemistry, Kasturba Medical College, Manipal, Karnataka.

Lipid metabolism in epididymal spermatozoa—DR S.R. ANAND, Department of Biochemistry, National Dairy Research Institute, Karnal.

Unit for serodiagnosis and seroepidemiology of amoebiasis—DR M.C. PADMA, Department of Genetics, Osmania University, Hyderabad.

Structure-activity correlations for polymyxin B and mutual potentiation effects of peptide antibiotics in bacterial and model systems—DR L.K. RAMACHANDRAN, Department of Biochemistry, Osmania University, Hyderabad.

Immunity in amoebiasis—DR V.K. VINAYAK, Department of Experimental Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh.

Effect of H_2S and SO_2 on brain lipids—DR MAHDI HASAN, Department of Anatomy, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh.

Biological Research Committee

Mycotoxin-producing fungal isolates associated with commercial lots of some pulses in Agra Mandi—DR J.S. GUPTA, Department of Botany, Agra College, Agra.

Induction of mutations in blue-green algae by heavy metal ions—DR A.K. KASHYAP, Department of Botany, Banaras Hindu University, Varanasi.

Regulation of X-chromosome activity in *Drosophila*—DR S.C. LAKHOTIA, Banaras Hindu University, Varanasi.

Effect of pollutants, disease and nutrition on the haematology of certain commercially important freshwater fishes of India—DR P.K. PANDEY, Bhagalpur University, Bhagalpur.

Analyses of the problem of grainfilling in sunflower and its modification with special reference to source, sink and translocation system control of the process—DR K. GUPTA, Department of Applied Botany, Burdwan University, Burdwan.

Food uptake of nematode parasites inhabiting different sites of the body of vertebrates of economic importance—PROF. G. MAJUMDAR, Department of Zoology, Burdwan University, Burdwan.

Preservation of stored grains by natural volatile compounds against fungal deterioration—DR B. NANDI, Department of Botany, Burdwan University, Burdwan.

Effect of X-rays on legume protoplasts and their differential radiosensitivity at different stages of development—DR S.C. ROY, Department of Botany, Calcutta University, Calcutta.

Pollution and pollutional effects of industrial wastes on the reproductive cycling of certain freshwater tropical fishes—DR KAMLESHWAR PANDEY, Department of Zoology, Gorakhpur University, Gorakhpur.

Cell cycle analysis and nucleocytoplasmic interactions in amoebae treated with chemical mutagens—DR S. CHATTERJEE, School of Life Sciences, Jawaharlal Nehru University, New Delhi.

Seed dormancy of non-cultivated arid-zone plants with reference to growth inhibitors—DR P.C. MULLICK, University of Jodhpur, Jodhpur.

Diseases of tree spices in Kerala—DR M.C. NAIR, Department of Plant Pathology, College of Agriculture, Vellayani.

Cytogenetic studies in certain childhood disorders—DR P.C. BAJPAI, K.G. Medical College, Lucknow.

Immunological properties of the larval and adult antigens of *Ascaris suum*—DR S.P. GUPTA, Department of Zoology, Lucknow University, Lucknow.

Parasitological studies on blood-sucking arthropods and their hosts—PROF. B. DASGUPTA, Government College, Darjeeling, West Bengal.

Histochemical, biochemical and histopathological observations on principal tissues of a few freshwater teleosts under varied ecophysiological conditions—DR L.D. CHATURVEDI and DR B.D. JOSHI, Hindu College, Moradabad.

Biochemical aspects of potato-stem canker and dry rot—DR (MRS) SUDHA MALL, Madhav Science College, Vikram University, Ujjain.

Chemical Research Committee

Mixed micelle and formation of alkyltrimethylammonium chelates in aqueous and non-aqueous media—DR P.M. GUPTA, Department of Chemistry, K.R. College, Mathura.

Analytical applications of the silver-silver sulphide electrode in the potentiometric determination of sulphur-containing ions or molecules and in their titrations involving complex formation reactions—DR A.K. GURTU, Department of Chemistry, B.S.A. College, Mathura.

Emulsification and interaction studies of some detergents—DR L.R. SINGH,

Department of Chemistry, B.S.A. College, Mathura.

Transport through liquid ion exchange membranes—DR M.A. BEG, Department of Chemistry, Aligarh Muslim University, Aligarh.

Multiphase flow behaviour of microemulsions—polymer solutions through capillary systems in relation to tertiary oil recovery process—DR H.N. SINGH, Department of Chemistry, Aligarh Muslim University, Aligarh.

Synthetic and structural studies of bimetallic tetrathiocyanate and tri-thiocyanate complexes with biologically active ligands—SHRI S.A. KHAN, Department of Chemistry, M.L.K. P-G College, Balrampur.

Utilization of mica dust waste as a source of potassium for fertilizers—DR K. GHOSH, Agricultural Chemistry, University College of Agriculture, Calcutta University, Calcutta.

Newer aspects of a study of alkoxides and allied derivatives of various elements—PROF. R.C. MEHROTRA, Vice Chancellor, University of Delhi, Delhi.

Inorganic polymers and glass-forming systems—DR H.N. BHARGAVA, Department of Chemistry, Gorakhpur University, Gorakhpur.

Dinitrogen transition metal complexes and fixation of molecular nitrogen—DR S.S. PARMAR, Department of Chemistry, Guru Nanak Dev University, Amritsar.

Spectroscopic and theoretical investigations on ion-molecule interactions—PROF. A.S.N. MURTHY, Indian Institute of Technology, New Delhi.

Selective solvation of ions in mixed solvents—DR C. KALIDAS, Department of Chemistry, Indian Institute of Technology, Madras.

Hydrodesulphurization reaction on molybdena/alumina supported oxides of cobalt, zinc, nickel and copper—DR V. SRINIVASAN, Department of Chemistry, Indian Institute of Technology, Madras.

Thermodynamic studies on artificial membrane having certain biomembrane constituents—DR S.A. RIZVI, Depart-

ment of Chemistry, Lucknow University, Lucknow.

Phenomenon of metal template effect in some synthetic macrocyclic complexes—DR (MRS) P.R. SHUKLA, Department of Chemistry, Lucknow University, Lucknow.

Trace heavy metals (Hg, Pb, Cd, Ti, Mo, V, Zr, As, Sb and Bi) in the environment and industrial effluents; methods of detection, determination, separation and their control—DR Y.K. AGARWAL, Pharmacy Department, Faculty of Technology & Engineering, M.S. University of Baroda, Baroda.

Thermotropic liquid crystals—DR R.A. VORA, Applied Chemistry Department, M.S. University of Baroda, Baroda.

Mixed ligand complexes of platinum group metal ions with purines, pyrimidines, nucleosides, their Schiff's bases and other nitrogen-containing ligands—DR (MRS) BADAR TAQUI KHAN, Department of Chemistry, Nizam College, Hyderabad.

Kinetics and mechanism of the reactions of carbon tetrahalides with electron donors—DR D.V.S. JAIN, Department of Chemistry, Panjab University, Chandigarh.

Molecular thermodynamics and viscous flow properties of liquids, liquid mixtures and polymer solutions—SHRI B.K. SHARMA, Regional College of Education, Bhubaneswar.

Civil & Environmental Engineering Research Committee

Erosion due to liquid jet impingement—DR B.C. SHYAMALA RAO, Assistant Professor, Indian Institute of Science, Bangalore.

Dynamics of suspended cable structures—DR C.K. RAMESH, Professor of Civil Engineering, Indian Institute of Technology, Bombay.

Stabilization of expansive clays by lime slurry pressure injection—DR A. SARGUNAM and DR BOOMINATHAN, Department of Soil Mechanics & Foundation Engineering, College of Engineering, Madras University, Madras.

Punching shear in restrained slabs—SHRI K.T. KRISHNASWAMY and SHRI H.U. KULKARNI, Department of Applied Mechanics, Walchand College of Engineering, Sangli.

Analysis and design of well and pier caps—PROF. PREM KRISHNA, Department of Civil Engineering, Roorkee University, Roorkee.

Chemical Engineering Research Committee

Grinding of metals by vibration mill—DR M. RAMANUJAN, Department of Chemical Engineering, Indian Institute of Technology, Madras.

Flow through porous media—DR D.D. KALE, Reader in Chemical Engineering, University of Bombay, Bombay.

Performance of regular packings: evaluation of mass transfer characteristics and study of liquid distribution—DR V.G. PANGARKAR, Department of Chemical Technology, Bombay University, Bombay.

Earth Sciences Research Committee

Controls of phosphate mineralization in proterozoic and palaeozoic rocks of India—DR D.M. BANERJEE, Geology Department, Delhi University, Delhi.

Stratigraphic-palaeontological (microplanktons and algal remains), sedimentological and paleoenvironmental studies of the calcareous, arenaceous and argillaceous sequences in parts of Pithoragarh (Pithoragarh Dist.) and adjoining areas in the Kumaun Himalayas, India—DR A.C. NAUTIYAL, Department of Geology, University of Lucknow, Lucknow.

Geohydrological studies in Thiruvanniyur Covelong Basin, South Madras—DR R. SAKTHIVADIVEL, Professor of Hydraulic Engineering, College of Engineering, Madras.

Sulphide mineralization in relation to stratigraphy, structure and metamorphism in the Saladipura-Khetri belt, north-eastern Rajasthan—DR A. MOOKHERJEE & DR K. NAHA, Department of Geology, Indian Institute of Technology, Kharagpur.

Electronics & Instruments Research Committee

Design and development of high-gain microwave horn antennas using corrugated flange technique—DR K. GOPALAKRISHNAN NAIR, Department of Physics, Cochin University, Cochin.

Analysis of radiation patterns of reflector antennas employing SME techniques—DR M.S. NARASIMHAN, Department of Electrical Engineering, Indian Institute of Technology, Madras.

Mechanical Engineering Research Committee

Design, development and fabrication of cross-flow fan—PROF. S. SUNDARAM and SHRI P.R. THIYAGARAJAN, Mechanical Engineering Department, P.S.G. College of Technology, Coimbatore.

Development of a stratified charge combustion engine using differential carburetion—PROF. K. MAHADEVAN, DR B.S. SAMAGA and SHRI F.G. KODOLI, Karnataka Regional Engineering College, Srinivasanagar.

Metals & Refractories Research Committee

Improvement in performance of foundry cupola through optimization of design and process parameters—SHRI P.L. JAIN, Head, Department of Production Engineering, National Institute of Foundry and Forge Technology, Hatia, Ranchi.

Study of metal flow to aid process design in closed-die forging of single phase and particulate composite material components—DR L.S. SRINATH, Department of Mechanical Engineering, Indian Institute of Science, Bangalore.

Use of continuously anodized aluminium conductors in transformers and motors—SHRI V.G. CHAPEKAR, Department of Metallurgy, College of Engineering, Poona.

Electrochemical studies to evolve suitable passivators for mild steel in aqueous environments—PROF. T.P. SASTRY, Department of Chemistry,

S.V.R. College of Engineering and Technology, Surat.

Stress corrosion cracking of prestressing steel wires—DR K.P. SINGH, Department of Metallurgical Engineering, Indian Institute of Technology, Kanpur.

Physical Research Committee

Conduction phenomena and dielectric properties of polymer films in audio frequencies—DR K. BARUA, Department of Physics, Dibrugarh University, Dibrugarh.

Galvanomagnetic properties of ferromagnetic films of Ni, Co, MnBi and CuNi—DR A.K. PAL, Department of General Physics & X-Ray, Indian Association for the Cultivation of Science, Calcutta.

Pulsatile blood flow through slowly diverging tubes and arteries of small diameter and arterioles, and its application to cardio-vascular diseases—DR P.C. JAIN, Department of Mathematics, Indian Institute of Technology, Bombay.

Instabilities in MHD power generator—DR M.L. MITTAL, Department of Mathematics, Indian Institute of Technology, Bombay.

Ion implanted dielectrics and metals for industrial applications—DR M.R. BHIDAY and DR V.N. BHORESKAR, Department of Physics, Poona University, Poona.

Electroluminescent materials in thin film and powder form—DR R.N. KAREKAR, Department of Physics, Poona University, Poona.

Inelastic scattering of gamma rays from K and L shell electrons—DR B.S. GHUMMAN, Department of Physics, Punjabi University, Patiala.

Conformational analysis of biomolecular structures by X-ray diffraction methods—DR S.G. BISWAS, Department of Physics, Visva-Bharati, Santiniketan (West Bengal).

Relaxation processes in some optical materials using N_2 -pulsed laser—DR R.D. SINGH, Department of Physics, Kurukshetra University, Kurukshetra.

Pharmaceuticals, Pesticides and Organic Intermediates Research Committee

Biologically active plant products and plant insecticides—DR A. BANERJI, Department of Pure Chemistry, University College of Science, Calcutta.

Synthesis of heterocyclic systems—DR C.K. GHOSH, Department of Biochemistry, Calcutta University, Calcutta.

Bio-mathematical studies on drug dependency and tolerance—PROF. J.J. GHOSH and DR A.B. ROY, Department of Biochemistry, Calcutta University, Calcutta.

Biogenetic type synthesis of polyketide metabolites using carbonyl synthesis—DR SERJINDER SINGH, Department of Chemistry, Guru Nanak Dev University, Amritsar.

Synthesis of flame retardant phosphorus compounds and their application to textile fibres and other polymers—DR (MISS) PUSHPA BAJAJ and DR N.K. JHA, Department of Textile Technology, Indian Institute of Technology, New Delhi.

Graft copolymerization of starch with vinyl monomers—PROF. (MRS) I.K. VARMA and DR N.K. SANDLE, Department of Chemistry, Indian Institute of Technology, New Delhi.

Synthesis and pharmacology of fusaric acid analogues—PROF. O.D. GULATI, Department of Pharmacology, Medical College, Baroda.

Chemical investigation on some Indian medicinal plants of Flacourtiaceae family—PROF. H.N. KHASTGIR, Chemistry Department, University of North Bengal, Raja Rammohunpur, Darjeeling Dist.

Synthesis of potential neuromuscular blocking agents—PROF. HARKISHAN SINGH, Department of Pharmaceutical Sciences, Panjab University, Chandigarh.

Natural steroids and terpenoids—DR (MRS) DEBI CHAKRAVORTI, Bethune College, Calcutta.

Total synthesis of prostaglandins and analogues—PROF. G.S.R. SUBBA RAO, Department of Organic Chemistry, Indian Institute of Science, Bangalore.

PATENTS ACCEPTED

Indian Pat. 2760/Cal/74

An improved mobile amplitude-modulated transreceiving apparatus

P.K. RANGOLE & H.K. JAIN

Central Electronics Engineering Research Institute, Pilani

It is customary to apply a modulating signal in an amplitude-modulated low-power Citizens Band (CB) transreceiver through bulky modulating transformers. Incorporation of these transformers in the small space available for low-power hand-held transreceivers of the type mentioned above has been creating some problems to designers and manufacturers.

The improved transreceiving apparatus, covered by the patent, eliminates the modulating transformer by directing the modulating signal to the appropriate RF stage of amplification by suitable miniature RF chokes and other components. The modulating signal is then fed to the emitter of the appropriate RF transistor. The choice of bias resistances and other associated components is dictated by signal-flow and impedance level considerations.

The improved apparatus gives the following relative advantages: (i) economy of space by virtue of elimination of bulky audio and modulating transformers, (ii) avoidance of incidental distortion and frequency limitations imposed by the modulating transformer, (iii) possibility of using lightly biased class C stages for emitter modulation in amplitude-modulated low-power transmitters/transreceivers, (iv) relative economy in the number of components used in the apparatus, and (v) better adaptability of the modified circuit for conversion to integrated circuit and hybrid forms.

Indigenous manufacture of the CB transreceivers (100 mW and 300 mW) incorporating the modifications covered by this patent has been already started by Punjab Wireless Systems Ltd (PWSL), a state government undertaking, which has taken up the CEERI know-how following the success of a demonstration plant financed by PWSL

and the National Research Development Corporation of India.

PERSONNEL NEWS

Appointments/Promotions

Dr A. Roy

Dr Amalendu Roy has taken over as Acting Director, National Geophysical Research Institute, Hyderabad [CSIR NEWS, 28(1978),86].

Dr Roy's researches in geophysical exploration methods have resulted in the development of some new techniques and discovery of some ores.

Dr Roy has won the IGU Decennial Award (1975) for outstanding contributions in exploration geophysics. He was Unesco consultant in geophysics (professor of geosciences) at the Federal University of Bahia, Brazil, from August 1973 to February 1974. Until recently, he was also the project manager for a UNDP project on 'Mineral exploration techniques'.

Dr Roy is on the board of editors of *Geoexploration*. He has to his credit about 100 papers and reports.

Dr Roy (born 1 Jan. 1924) studied at the Calcutta and the Dacca universities, and the Colorado School of Mines (USA). Before joining NGRI in 1964 as Deputy Director, Dr Roy was Superintending Geophysicist and Deputy Director with the Oil & Natural Gas Commission. Earlier, he worked in the Geological Survey of India (1947-54), and taught at the Indian Institute of Technology, Kharagpur (1954-61).

Shri S.R. Chaturvedi

Shri S.R. Chaturvedi, ICAS, has been appointed Deputy Chief (Finance) at the CSIR Headquarters, New Delhi (29 July 1978). He is on deputation from the Office of the Controller General of Accounts, Department of Expenditure, Union Ministry of Finance.



Consequent on assessment, the following personnel of the National Geophysical Research Institute (NGRI), Hyderabad, have been promoted: Shri P. Radhakrishna Murty (as Scientist C; 26 Sep. 1977); Dr D.D. Sarma (as Scientist C; 1 Dec. 1977); Dr M.S. Joshi (as Scientist C; 9 Feb. 1978); Shri Indra Mohan (as Scientist C; 9 Feb. 1978); Dr B.N. Satpathy (as Scientist C; 29 March 1978); Dr R.L. Dhar (as Scientist C; 29 March 1978); Shri Dipankar Sarkar (as Scientist A; 5 Dec. 1977); Shri D.D. Singh (as Scientist A; 5 Dec. 1977); Shri R.K. Drolia (as Scientist A; 5 Dec. 1977); Shri N.R. Nath (as Scientist A1; 27 Dec. 1977); Shri A.N. Bhattacharya (as Scientist A1; 3 Jan. 1978); Shri I. Bala Parameswar Rao (as Scientist A1; 17 Jan. 1978); Shri J.S. Agrawal (as Scientist A1; 22 Jan. 1978); and Shri G.V.R. Murty (as Scientist A1; 8 Aug. 1976). (Shri Murty is presently working as Purchase Officer at the Regional Research Laboratory, Jorhat).

Honours

Shri S. Arunachalam, Editor, Publications & Information Directorate, New Delhi, has been nominated a member of the editorial board of the new-style *The Information Scientist* (provisionally renamed *Information Science*), the official journal of the Institute of Information Scientists, London, which from 1979 will be published in collaboration with the North-Holland Publishing Company, Amsterdam.

Research & Industry Get-Together at CECRI

As a part of its silver jubilee celebrations, the Central Electrochemical Research Institute (CECRI), Karaikudi, is holding a Research & Industry Get-Together from 18 to 21 September 1978. Technical sessions will cover: (1) Industrial electrolytic cells for production of organic and inorganic products; (2) Electrometallurgy and electrothermal products; (3) Electrodeposition and metal finishing; (4) Corrosion and its prevention; (5) Power

sources; and (6) Solid state electrochemistry. Besides, one session will be devoted to promotion of small-scale and cottage industries in rural areas.

Key papers highlighting the capabilities, the results achieved and the future programme of work of CECRI in each of the areas will be presented by a senior scientist of the institute. Representatives from industry will, by invitation, present key papers indicating the present trend of the concerned industry and the problems faced by them. Discussions will follow the presentation of key papers.

All communications regarding the get-together may be addressed to the convener Shri V. Aravamuthan, Central Electrochemical Research Institute, Karaikudi 623006.

Governing Body

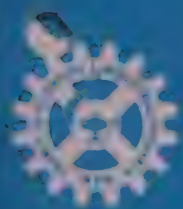
The term of nomination of Dr S.R. Valluri, Director, National Aeronautical Laboratory, Bangalore, as chairman, Coordination Council, Engineering Sciences Group, has been extended up to 31 December 1978.

Dr Harsh Vardhan, Director, Central Scientific Instruments Organisation, Chandigarh, has been nominated chairman, Coordination Council, Physical & Earth Sciences Group, for a period of two years with effect from 13 May 1978 in place of Dr Hari Narain, Director, National Geophysical Research Institute, Hyderabad, who has taken over as Vice Chancellor, Banaras Hindu University, Varanasi.

As chairmen of the coordination councils, Dr Valluri and Dr Harsh Vardhan will also be members of the Governing Body of CSIR. They will also be members of the Society (CSIR) for the period for which they are members of the Governing Body.

CIMPO Renamed as CIMAP

The Central Indian Medicinal Plants Organisation (CIMPO), Lucknow, has been renamed as Central Institute of Medicinal and Aromatic Plants (CIMAP).



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

FIE Award for Dr Paranjpe

Dr Pramod A. Paranjpe, Head, Propulsion Division, National Aeronautical Laboratory (NAL), Bangalore, has been awarded the 1978 Fuel Instruments and Engineers Foundation Award in the industrial and technology sector for his meritorious contributions in the field of turbomachinery engineering. The award carries a plaque and a cash prize of Rs 25,000.

Dr Paranjpe (born 1 April 1934) obtained his B.Tech. degree in mechanical engineering from the Indian Institute of Technology, Kharagpur, with first class honours in 1955. Proceeding to Switzerland to work in the research and development divisions of the Swiss industry, he made some pioneering and significant contributions in engineering. One of his notable achievements relates to a novel 'Monte Carlo' approach for flow analysis in turbomachinery and its application in the development of a surge-free centrifugal compressor for a nuclear power station and an industrial centrifugal compressor with excellent characteristics, which became a standard design for years to come. Other achievements include (i) hydrodynamic design of a diagonal reversible pump-turbine with variable stagger rotor and guide blades, and a rational design approach for radial reversible pump-turbines; and (ii) aerodynamic design of a variable geometry supersonic vaned

diffuser for a refrigeration compressor, which has resulted in unique characteristics.

In 1963 Dr Paranjpe was awarded the degree of Doctor of Technical Sciences by the Swiss Federal Institute of Technology (ETH), Zurich, for his thesis entitled 'Monte Carlo approach to the flow problems of turbomachinery'.

Returning to India in 1964 Dr Paranjpe joined the Indian Institute of Technology, Kanpur, and moved to NAL as head of its propulsion division in 1966.

Dr Paranjpe has taken considerable initiative and interest in conceiving, planning and providing technical leadership towards the establishment of versatile and comprehensive experimental facilities for applied research in turbomachinery. Since 1975 he has been the project director for a UNDP/Unesco assisted project entitled 'Establishment of turbomachinery and combustion laboratory' at NAL. He initiated some innovative research programmes and novel techniques for ignition and flame stabilization in afterburners of aviation gas turbines such as catalytic ignition, pyrogenic ignition and jet curtain flameholders. Through model tests carried out under simulated conditions he has demonstrated that these techniques have significant advantages over the established practice in gas turbine engineering.

A Fellow of the Indian Academy of Sciences, Dr Paranjpe is associated with a number of technical committees and professional bodies. He has to his credit a number of publications and patents relating to various types of turbomachinery.

Pilot Plant for Carbon Black at RRL, Jorhat

A pilot plant (capacity, 200 kg/day) for the production of carbon black has been set up at the Regional Research Laboratory (RRL), Jorhat. The laboratory undertook advanced development work on carbon black from Assam coal on behalf of Union Carbon Black Ltd (UCBL), Gauhati, who have been licensed to commercialize the process. The pilot plant would enable the laboratory to study the various reaction parameters, train the operating staff for a commercial plant and produce carbon black for UCBL for market study and promotion.

Carbon black is extensively used in rubber and tyre production as reinforcing filler. The demand of carbon black for 1978-79 is estimated at 88,500 tonnes.

The plant was inaugurated on 5 June 1978 by Shri Dulal Chandra Barua, Minister of P.W.D. and Supply, Government of Assam.

Antitubercular Compounds: Substituted Thioureas and their Derivatives

Many N,N-disubstituted thioureas show antitubercular activity. Previous workers have observed that the replacement of the substituent on nitrogen by a quinoline nucleus helps retain the antitubercular activity. Prompted by this observation, Shri K.V. Kale, a CSIR junior research fellow working at the National Chemical Laboratory (NCL), Poona, prepared several substituted thioureas, 2-thiohydantoins and 4-thiazolidones



having quinoline moieties and tested a number of them for antitubercular activity *in vitro*. Special interest was paid to quinoline ring as 8-alkoxyquinolines and aminoquinolines are generally bacteriostatic.

Shri Kale prepared (i) 1-(substituted quinolyl)-3-(*p*-substituted phenyl)-2-thiourea by condensing 5-amino-8-ethoxyquinoline, 5-amino-8-*n*-butoxyquinoline, 5-amino-8-chloroquinoline, 8-amino-5-chloroquinoline, 6-aminoquinoline and 8-amino-5-methoxyquinoline with different *p*-substituted phenyl isothiocyanates (the substituents being H, Cl, CH₃, OCH₃, OC₂H₅ and OC₄H₉); (ii) 1,3-bis(substituted quinolyl)-2-thioureas using the same quinolines as in (i); and (iii) 1-(substituted quinolyl)-2-thioureas using the same quinolines as in (i). He also prepared cyclic analogues of thioureas, viz. (i) 1-(substituted quinolyl)-3(*p*-substituted phenyl)-2-thiohydantoins; (ii) 2-(substituted quinolylimino)-3-(substituted quinolyl)-4-thiazolidinones and 2-(phenylimino)-3-(8-ethoxyquinolyl)-4-thiazolidinones.

A majority of these compounds was tested *in vitro* for antitubercular activity. Out of the 68 compounds tested, two compounds showed a maximum activity at 0.2 meg/ml, which is almost twice that of *p*-aminosalicylic acid (PAS) (0.4 meg/ml) and 5 times that of streptomycin (1 meg/ml); the activity of 11 compounds was twice that of streptomycin and almost equal to that of PAS, and one compound was as active as streptomycin.

Shri Kale has been awarded Ph.D. degree of the Poona University for his thesis based on these studies. He worked under the guidance of Dr S.N. Kulkarni of NCL.

Sparse Matrix Techniques

Solution of large sets of linear equations generally leads to large sparse linear equations which are difficult to solve on the available computer storage or it becomes very expensive to invert the matrices involved. Sparse matrices

occur in numerical solution of differential equations, structural analysis, network theory, communication systems, power distribution systems, etc. These matrices have a large percentage of zero elements and it is a wastage of computer storage and time to store and operate on them as such. Conversion of these matrices into compact form, with storage and operation of only non-zero elements, would result in the handling of larger sizes of the matrices and saving of substantial amount of time.

Towards this end the National Aeronautical Laboratory (NAL), Bangalore, has developed efficient algorithms to handle such sparse matrices in compact form using linked lists. A suite of computer programmes has been developed for large sparse banded and random sparse equations with or without pivoting. Some of the salient features of the algorithms and programmes are: (i) identification of the type of matrix, (ii) formation of lists, (iii) retrieval of an element, (iv) insertion of new non-zero elements created in the process, (v) release of an element, (vi) re-use of empty spaces due to released elements, (vii) pivot selection, (viii) list merging, (ix) acceleration of elimination, and (x) formation of solution vector.

Besides, efficient algorithms for many important sparse matrix operations like transpose and multiplication stored in compact form have been developed. A new fill-in criterion has been developed at each step of the Gaussian elimination, so that additional elements created in the process (fill-in) are kept to a minimum. This in turn helps save storage, and reduce computational effort. Efficient techniques have also been developed for the best selection of pivot, based on: (i) least fill-in criterion, (ii) least multiplication count, and (iii) least time computed by the cost criterion function involving both fill-in and arithmetic count.

The techniques developed at NAL save computer storage and time, and lead to less round-off errors and prove very useful when a system of equations is expected to be solved several times with

the same zero, non-zero structure, but differing in numerical values.

Deputation Briefs

Dr S.D. Gomkale of the Central Salt & Marine Chemicals Research Institute, Bhavnagar, visited France from 26 May to 7 July 1978 on deputation under the CSIR-CNRS Exchange Programme. The main object of his visit was to study the modern developments in France in the area of solar energy utilization. Dr Gomkale visited the Department d'Heliophysique, Université de Provence, Faculté des Sciences-Saint Jersome, Marseille, and the Sciences—Sant d'energetique solaire, Odeillo, where he acquainted himself with the work being carried out on solar cooling, hot-air engines, solar pumps, etc.

* * *

Dr B.R. Sant of the Regional Research Laboratory, Bhubaneswar, visited USA from 11 May to 10 June 1978 under the United States-India Exchange of Scientists Programme and acquainted himself with the latest technological trends in microbial leaching, extractive metallurgy, mineral processing, and mineral utilization. Dr Sant visited nine organizations, which included *inter alia* R&D centres concerned with mining, metallurgical, mineral, and materials technology. At the Division of New Mexico Bureau of Mines and Mineral Resources and the College Division of New Mexico Institute of Mining and Technology, Socorro, where he stayed for about a week, Dr Sant carried out some work on bioleaching and also delivered a seminar talk on 'Bacterial leaching of Indian copper ores'. He visited a number of commercial dump-leaching operations in the copper mining areas in Arizona. He also visited the world's largest open pit mine in Utah of the Kennecott Copper Corporation where nearly 13% of copper output is obtained through leaching and precipitation. In leaching operations, recovery of copper is achieved through solvent extraction and electrowinning (cathode copper) or cementation with iron.

Dr Sant is the coordinator of the CSIR inter-laboratory project on recovery of metallic values by bacterial leaching.

Shri R. Paramasivam of the National Environmental Engineering Research Institute (NEERI), Nagpur, visited the WHO International Reference Centre (WHO IRC) for Community Water Supply, The Hague, Netherlands, as a short-term consultant and temporary adviser for the International Research-cum-Demonstration Project on Slow Sand Filtration.

During his stay from 17 April to 5 May 1978, he compiled a draft manual for operation and maintenance of small, slow sand filtration schemes. This document, after review by international experts, is to be published by WHO IRC. He also reviewed a draft manual for design and construction of small, slow sand filtration plants in developing countries, and participated in a group discussion with the authors of the manual and contributed to its improvement in the light of information and experience gathered on the subject in India. NEERI, a collaborating centre of WHO IRC, has been participating in this project for India.

Dr M.C. Vaidya of the Central Salt & Marine Chemicals Research Institute, Bhavnagar, visited West Germany from 6 April to 5 July 1978 on deputation under the CSIR-DAAD Exchange of Scientists Programme to study the recent methods adopted for the recovery of chemicals from brine and bittern. He carried out conductance measurement on magnesium chloride, magnesium sulphate, mixtures of these two in varying concentrations, and halides of calcium and strontium in aqueous solutions. The measurements were performed in concentrated solutions as a function of concentration, up to the saturation of the electrolyte compounds, and as a function of temperature within the temperature range 10°-40°C. The purpose of the investigation was to generate transport data and their

temperature dependence in the case of technologically important processes like electrolysis of sea bittern for the manufacture of magnesium hydroxide.

Dr Vaidya visited the R&D laboratories of Analytical and Pharmaceutical

Division of E. Merck Darmstadt, the potash mines of Kali Und Saltz at Heringen and the R&D laboratories and plants producing urea, methanol, formaldehyde and melamine at BASF, Ludwigshafen.

UTILIZATION OF FOREST AND AGRO-INDUSTRIAL LIGNOCELLULOSIC WASTES

Jammu Laboratory's Efforts & Contributions

J.S. Chawla*

Regional Research Laboratory, Jammu 180001

In the north-western Himalayan region, which abounds in thick forests consisting mainly of coniferous trees, besides deciduous and other plant species, and in the northern plains, which are agriculturally well developed, large quantities of surplus lignocellulosic materials are available both from the forest waste of timber industry and the agricultural produce. In addition, throughout the length and breadth of the country large quantities of lignocellulose are available as agro-industrial wastes such as rice straw, lemongrass, poppy straw, cotton stems, groundnut shells, rice husk and saw dust, besides forest wastes such as pine needles, *Lantana* stems, tree barks, and lops and tops of trees. These materials require thorough investigation not only because of their potential for commercial utilization but also because they create environmental and pollution problems.

Presently, the country's main sources of raw materials for the various kinds of cellulosic products are forest trees and bamboo. With the progress in literacy, industrialization and standard of living, the demand for cellulosic products like paper, rayon-grade pulp, and chemically modified cellulose packaging and building materials for various purposes is increasing at a very rapid rate, thus causing a heavy strain on our valuable forests. The indiscriminate cutting of the valuable forest plants may lead to ecological imbalances and prove hazardous. In order to reduce the pressure on

the forests, it has become necessary to look for alternative sources well in advance. Thus, the need to exploit agro-industrial and forest wastes requires no emphasis.

The Regional Research Laboratory (RRL), Jammu, through its Division of Cellulose Pulp and Board, set up in 1964, has been investigating the feasibility of utilizing the various types of lignocellulosic materials available in the northern part of India for use in various cellulosic products of industrial importance such as paper pulp, fibreboard, and cellulose derivatives, including fine chemicals like vanillin and levulinic acid, based on lignin cellulose.

More than 50 plant materials, consisting of coniferous woods, hard woods, fast growing plants, and agro-industrial wastes, have been investigated in the laboratory for assessing their use for the various types of cellulosic products. Some of the laboratory processes for the production of these materials have been scaled up in the pilot-scale plants. The division is equipped with pressure autoclaves, a laboratory-model hollander beater, a sheet former, disintegrators, freeness tester and hydraulic presses. Besides a chemical laboratory for carrying out chemical investigations, there are testing devices for conducting physical tests on the products.

An important feature of the efforts of this division is the emphasis given to the development of processes for the economic utilization of lignocellulosic waste for which the plant and equipment are completely indigenous and suited for

*Dr Chawla is the chairman of the Cellulose Pulp and Board Division of the laboratory.



A view of the pilot-scale Hollander beater with washing drum

rural and backward areas, particularly for the benefit of the small-scale units which are more labour-intensive.

A large number of lignocellulosic materials, particularly the agro-industrial and forest wastes, have been investigated and processes developed for small-scale units for the production of fibre building boards, strawboards, particle boards, file covers, cardsheets, cellulosic derivatives, etc. Dealt with in the following paragraphs are some processes and products developed by this laboratory.

Fibreboards

Fibreboard is a versatile structural material made out of the fibre of lignocellulosic materials. This is the only panel material which requires no external binder in its manufacture. The use of binder in other panel products makes them expensive. Fibreboard finds a myriad applications. In India the fibreboard industry is in the large-scale sector. No information is available on the manufacture of these boards in small-scale units. Work on the development of fibreboards from different wastes has been carried out at RRL, Jammu, with a view to bringing the industry to small-scale sector.

A process for utilization of pine needles (fallen leaves of 'Chir' pine trees, an annual renewable forest waste) for

the production of fibreboards, which are suitable for use in packing cases, has been developed at the laboratory. The needles are a fire hazard to the forest. The annual fall of the Chir needles (*Pinus roxburghii*) in the sub-Himalayan belt is about a million tonnes. No attempt has ever been made to put them to proper utilization. A complete process technology, suitable for small-scale units, for the utilization of pine

needles has been developed by the laboratory for the first time. The technology for a 2 tonnes/day unit has been given to a number of parties. A similar process based on rice straw for the production of fibreboards for different end uses has been developed and released. A small unit of 2 tonnes/day capacity offers direct and indirect employment to more than 100 persons. The plant and machinery are entirely indigenous. The utilization of pine needles has attracted the attention of UNIDO and other bodies. UNIDO, for instance, has shown interest in this laboratory's taking up investigations on pine needles of different species for the production of fibreboards. In collaboration with the Central Building Research Institute, Roorkee, the feasibility of using the fibreboards made out of pine needles as a roofing shingle has been investigated.

Fibreboards with satisfactory properties have also been developed from other agro-industrial residues such as poppy straw, cymbopogon grass, and veneer waste from match factories.

Fibre corners and angles have been developed for fabrication of packing boxes.



A view of the pilot-scale spherical rotary digester



Pine needles used for fibre boards: *Pinus roxburghii* (at left), and *Pinus caribaea*

Pine wool

Another product that could be made from the waste pine needles is the pine wool which could be used for stuffing mattresses, packaging fragile articles, and as an insulating wool. Its cost is one-fifth of that of cotton. The technology for processing 1-5 tonnes of pine wool per day has been developed and released to a couple of entrepreneurs.

Strawboards

Strawboard is a product made from the coarse pulp prepared out of straw and other agriculture residues. Strawboard is used for bookbinding, packaging, and for making cartons, air bags, etc. It is a product of mass consumption for various end uses. A process for the production of strawboard has been worked out and pilot-scale experiments have been carried out on a number of agro-industrial residues such as rice straw, rye straw, essential oil-extracted cymbopogon grass, and *Mentha arvensis*

herb (essential oil-extracted). Waste paper, old cartons and used corrugated medium have also been utilized in the production of millboards. Special types of millboards have also been made for use in the manufacture of suitcases. Schemes for their production in small-scale units with capacities of 0.5-2.5 tonnes per day have been given to entrepreneurs.

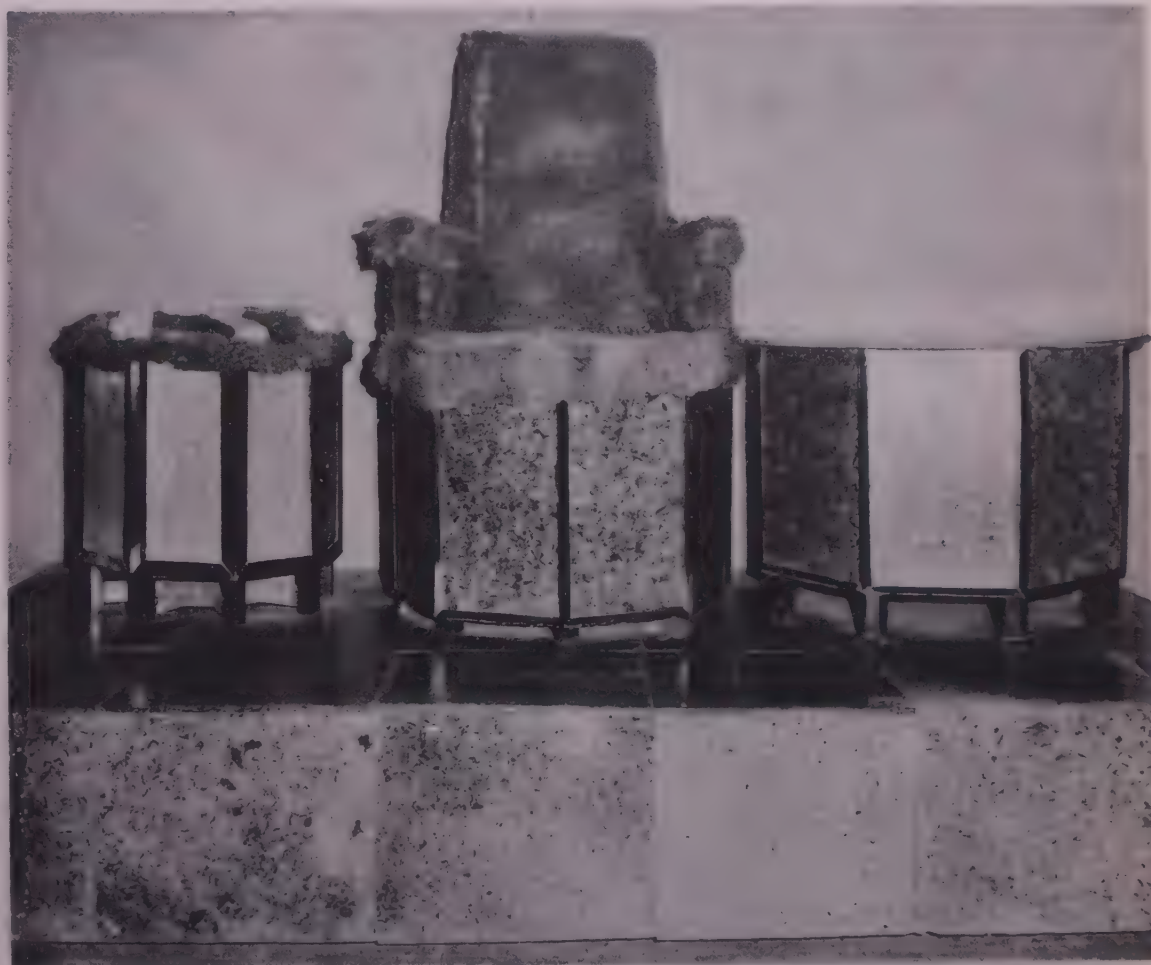
Particle boards

The laboratory has developed particle boards of varying densities from dif-

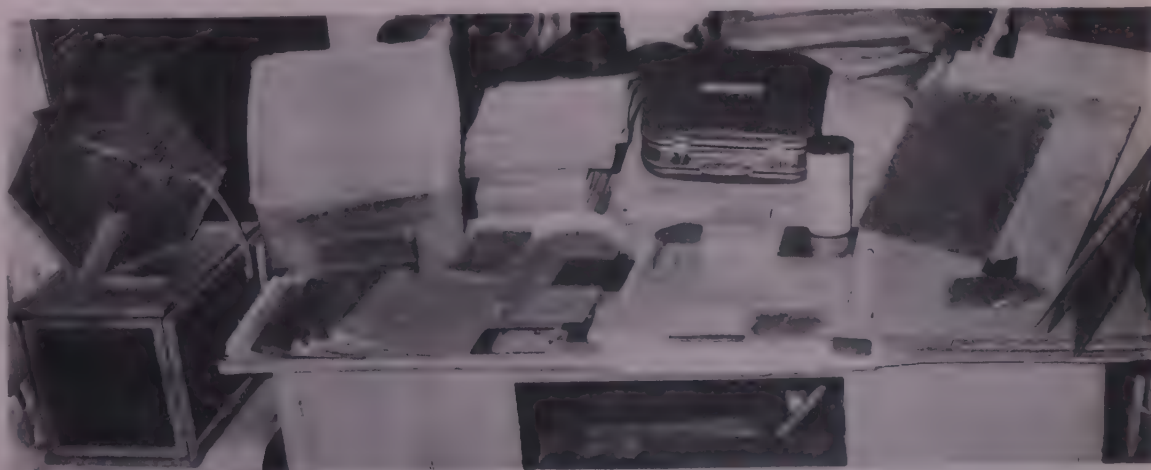
ferent agro-industrial wastes such as groundnut shells, rice husk, corn cobs, saw dust, veneer waste from match factories, mentha waste (waste of essential oil industry), and lantana stems. New binding compositions for the production of particle boards have also been worked out to replace a part of the expensive synthetic resins.

Dry fiberized pulp

A method for the production of dry fiberized pulp based on the recycling of waste paper has been developed. The use



Some furniture prepared from particle boards made from the residues of *Mentha arvensis*



A composite photograph of articles such as packing box, suitcase, file covers, particle board, cardboard, pine needle board, etc.

of dry fiberized pulp has been suggested for papier mache. The present practice adopted in making the pulp for papier mache articles is laborious and time consuming. The laboratory supplied about half a tonne of dry fiberized pulp for trial use in the papier mache industry in Kashmir. The local industry has found it acceptable for making papier mache articles.

File covers and cardsheets

Different blends of pulps have been made from various agro-industrial residues for use in the preparation of stationery articles like file covers and cardsheets.

Chemical from sawdust

The laboratory has developed a process

for the production of vanillin, a flavouring chemical in confectionery and an intermediate in the preparation of pharmaceuticals, etc., using coniferous wood sawdust (a waste of timber industry) as a source for lignin. The process has been scaled up in a 50-litre pressure reaction vessel.

Commercially, vanillin is prepared from iso-eugenol, and lignosulphonates, a byproduct of sulphite pulp mills. For economic and technical reasons, only the lignosulphonate of coniferous wood species is suitable for making vanillin.

Almost the entire demand for vanillin in the country is met by imports.

Services and facilities

As a part of the CSIR policy for the

transfer and development of technologies, projects are undertaken both on consultancy and sponsored basis. The consultancy work includes providing technical guidance on the problems of established units as well as on setting up new units for the production of strawboards, millboards, fibreboards, pine wool, file covers and cardsheets. Consultancy has been provided to a number of parties in the public sector as well as private sector.

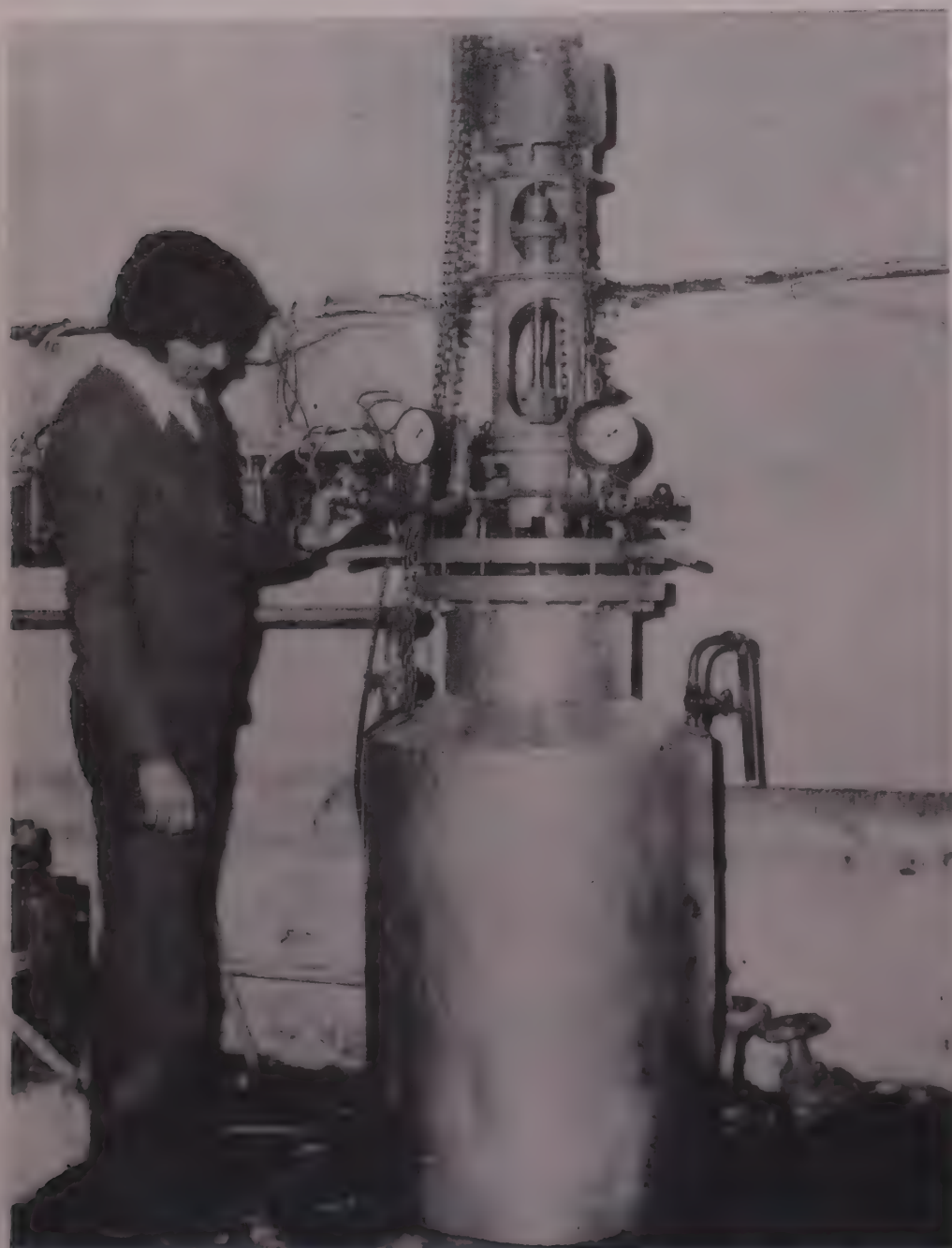
Training to entrepreneurs is given in the techniques involved in the manufacture of strawboards, fibreboards, particle boards, cardsheets and file covers. In recent years, such training was given to a number of young entrepreneurs.

A one-tonne pilot-scale unit, installed recently, for the production of strawboards, millboards and fibreboards, serves as a study-cum-demonstration unit. A scheme has been worked out to utilize the cellulosic waste material obtained after the hydrodistillation of essential oil. It is also proposed to investigate other agro-industrial materials.

CSIR in the Service of Rural Society

The Indian National Scientific Documentation Centre (Insdoc), New Delhi, has brought out a document entitled 'CSIR in the Service of Rural Society' which gives an overview of the activities of the Council of Scientific & Industrial Research and its laboratories in the areas relevant to rural development.

The publication (Pp.78, royal 8vo) contains ten chapters: Agro-technologies; Post-harvest technology; Rural industries; Waste utilization; Drugs and pharmaceuticals; Public health and sanitation; Buildings, roads and transportation; Energy; Karimnagar project; and Popularization of science. Appendixes show that as many as: (i) 321 CSIR technologies are relevant to rural areas; (ii) 75 products are useful for rural areas; and (iii) 154 major current research projects are relevant to rural areas.



Pilot-scale pressure reaction vessel (capacity, 50 litres) for vanillin preparation from sawdust

The compilers of the publication are Shri Surendar Mohan of Insdoc and Shri D. Bhushan of Technology Utilization Division of CSIR Headquarters.

Enquiries about the publication may be addressed to: Technology Utilization Division, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001.

Directory of Testing Facilities

The Indian National Scientific Documentation Centre (Insdoc), New Delhi, has taken up the compilation of a 'Directory of Testing Facilities in India' under the National Information System for Science and Technology (NISSAT) scheme of the Department of Science and Technology. The directory will cover facilities relating to the testing of agricultural and food products, chemicals, drugs & pharmaceuticals, instruments & appliances, materials, physical and engineering metrology, textiles, electrical engineering, electronics, etc. etc. Institutions and organizations which have such facilities, even if meant for in-house use only, may send particulars in this regard in conformity with the questionnaire designed for the purpose. Questionnaires may be obtained, on request, from the Scientist-in-charge, Insdoc, Hillside Road, New Delhi 110012.

PATENTS ACCEPTED

Indian Pat. 534/Cal/75

A process for preparation of solid ammonium persulphate

M.G. POTDAR, R. SRINIVASAN & H.V.K. UDUPA

Central Electrochemical Research Institute, Karaikudi

Ammonium persulphate is an intermediate product in the preparation of hydrogen peroxide by inorganic method. A solution of ammonium sulphate and sulphuric acid is electrolyzed using platinum as anode and lead as cathode. The formation of ammonium persulphate is a very sensitive reaction and needs very low

temperatures. The reaction is susceptible to trace impurities and the electrolysis will result in only oxygen, hydrogen and ozone (traces) if the conditions are not maintained within critical limits.

During electrolysis, ammonium sulphate gets oxidized to persulphate and its concentration in solution builds up. The solution is then taken to chillers where solid persulphate separates out. In this process, two unit operations are involved in addition to electrolysis. These are concentration of the effluent to saturation limit and chilling of the saturated liquor for separating the solid persulphate. During chilling some sulphate also may fall out. This will further involve a step of re-crystallization to get high-purity product.

The process covered by this patent eliminates the concentration and chilling operations, thus sizably reducing the handling of large quantities of solutions and possibilities of contamination during the two operations.

In the CECRI process, an aqueous solution of ammonium sulphate and sulphuric acid is electrolyzed in an undivided cell at room temperature and the solid ammonium persulphate starts separating out in the cell itself. The product is finely crystalline and highly pure, containing 95-98% ammonium persulphate and the balance being bound water. The cell effluent can be centrifuged straight away and the product can be washed free from acid contamination, and dried.

As minimum unit operations are involved in the CECRI process, handling losses are minimum and the volume of solution handled is also very low.

Ammonium persulphate is used as an oxidizing agent, a bleach, polymerization catalyst, metal etchant, etc. It is also the starting material for the preparation of persulphates of other metals, which have wide applications in textile, rubber and polymer industries. The country's requirement of per-

sulphates (annual requirement estimated at 300 tonnes) is met through imports.

Indian Pat. 923/Cal/76

Improvements in or relating to the process for electrochemical marking of metals

P. JAYAKRISHNAN, S. GURUSWAMY, N. SHANMUGAM & R. RAJAGOPAL

Central Electrochemical Research Institute, Karaikudi

The process covered by the patent is in extension of the CECRI process relating to electrochemical marking of metals and high-carbon steels (hardened), which are used in the manufacture of surgical instruments. The electrode holder used in the process is in accordance with specifications given in an earlier patent (Indian Pat. 118016). The electrolytes comprise a combination of sulphates of metals like sodium and iron in the concentration range of 8-15 % of sodium sulphate and 1-3 % of ferrous sulphate (by wt). Also covered by the patent is the method of transfer of letters/designs on to the metals from drawings with the help of a photographic negative. This procedure eliminates the use of stencil papers in the electrochemical marking process. Coloured electro-organic coatings can be produced in place of etched markings by following the procedure laid down in Indian Pat. 272/72.

PERSONNEL NEWS

Appointments/Promotions

Shri K.N. Srinath Reddy, Senior Scientific Assistant, National Geophysical Research Institute, Hyderabad, has been appointed, on promotion, as Scientist B1 (22 June 1978).

* * *

Consequent on assessment, Shri S.N. Saxena and Shri P.N.M. Menon of the Publications & Information Directorate, New Delhi, have been promoted as Production Officers (30 Nov. 1977).

Shri K.S. Bhatnagar

Shri K.S. Bhatnagar of the Indian Audit & Accounts Service has been relieved of his duties as Chief (Finance), CSIR

Headquarters, New Delhi, on 2 August 1978 consequent upon his appointment as Additional Secretary to the Government of India, Ministry of Defence, New Delhi.

Prof. M. Santappa

Prof. M. Santappa, Director, Central Leather Research Institute, Madras, has been appointed chairman, Coordination Council, Biological Sciences Group, for a period of two years with effect from 16 August 1978 in place of Dr N.K. Jain, Director, Tocklai Experimental Station, Jorhat, who has completed his tenure of two years as chairman.

PATENTS SEALED

2108/Cal/75 (142756): Stand-mounted cooking-gas indicator, T.S. Chennabasavan — MERADO, Poona.

115/Cal/75 (142695): Improvements in or relating to anodizing aluminium and its alloys using alternating current in sulphuric acid electrolyte, B.A. Sheno, V. Balasubramanian & S. John — CECRI, Karaikudi.

Shanti Swarup Bhatnagar Prizes (1978 & 1979) for Science and Technology

Nominations are invited by the Council of Scientific & Industrial Research (CSIR) for the Shanti Swarup Bhatnagar Prizes for Science and Technology for the years 1978 and 1979. These prizes, which number five or more and are of the value Rs 10,000 each, are given every year by CSIR for outstanding research, applied or fundamental, in the following disciplines: (i) Physical sciences; (ii) Chemical sciences; (iii) Biological sciences; (iv) Mathematical sciences; (v) Engineering sciences; (vi) Medical sciences; and (vii) Other sciences.

Any citizen of India below the age of 45 years as on 31 December of the year preceding the year of prize and who has made conspicuously important and outstanding contributions to human knowledge and progress, fundamental/applied, in the particular field of his endeavour by his work done in India during the five years preceding the year of prize is eligible for nomination.

The last date for receiving the nominations for prizes for 1978 is 31 October 1978. Nominations for prizes for 1979 will be received during January-March 1979. Nominations should be sent in sealed cover marked 'confidential' to Shri A.K. Bose, Head, Extra-Mural Research, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Further particulars can also be had from Shri Bose.

Training Course in Water Desalination

The Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, is organizing a short-term training course in water desalination from 6 to 15 November 1978. The main

object of the course is to acquaint engineers working in water supply and water treatment with the R&D work on desalination in order to utilize the knowledge for meeting the drinking water needs of arid, semi-arid, coastal and draught-prone areas in the country. The course is open to public health engineers, mechanical engineers, electrical engineers, chemical engineers, etc. who are actually connected with water supply and/or water treatment on a large scale either in rural or urban areas. There is no fee for the course.

Persons desirous of joining the training course may write before 30 September 1978 for their enrolment to the Director, Central Salt & Marine Chemicals Research Institute, Bhavnagar 364002.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 16/78

It is proposed to appoint two Scientists F for the National Geophysical Research Institute (NGRI), Hyderabad.

For Post No.1 (For regular activities of NGRI)

Job Requirements: This is a senior research management position and the incumbent will be required to: (i) provide high-level leadership to formulate plan and guide research and developmental activities in geophysical programmes and field investigations of the institute; (ii) identify technological problems and offer assistance in transfer of technology and developmental activities to concerned organizations. He may also be required to assist the Director in planning and execution of sponsored projects and in such other matters as may be assigned to him.

Qualifications (Essential): High academic qualifications in geophysics/geology, preferably a doctorate degree with extensive experience of laboratory and field research in applied geophysics and impressive record of published work.

For Post No. 2 (For UNDP Project in NGRI)

Job Requirements: This is a senior research management position and the incumbent will be required to work in the area of techniques of exploration for mineral resources involving: (i) R&D in exploration techniques, and (ii) design, development and production of geophysical instruments. He will also be required to assist the Director in such other matters as may be assigned to him.

Qualifications (Essential): High academic qualifications in geophysics/physics (with electronics)/radiophysics/electronics, with long experience of research in geophysical exploration techniques, especially in design, development and fabrication of electrical and electronic instruments for geophysical measurements and original contribution in research and/or development as evidenced by publications.

Salary/Conditions of Service: The salary scale attached to the posts is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The persons selected will be appointed on contract for a period of six years which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain six copies of the standard proforma, for sending their *curriculum vitae*, from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proformas will be received in this office on or before 25 October 1978.

Persons who had already applied in response to our advertisement No. 42/76 for the posts of Scientist F, NGRI, Hyderabad, may also apply again with their full biodata in the prescribed form.

Convassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the posts.



CSIR NEWS

VOL 28 NO 18 30 SEPTEMBER 1978

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

International School of Milling Technology at CFTRI

The foundation stone for an International School of Milling Technology was laid at the Central Food Technological Research Institute (CFTRI), Mysore, on 7 August 1978 by Shri Govind Narain, Governor of Karnataka.

The school, the first ever in the third world, has been established in India because of the long-felt need of the country's flour milling industry for adequate trained manpower to meet the challenges posed by increased supplies of wheat of widely varying quality characteristics. A collaborative venture of the Government of India and the Swiss Confederation to train personnel for executive and supervisory functions in the roller flour milling industry, the school lays special emphasis on conditions specific to India and south and south-east Asia which share more or less similar problems. The school will also promote better techniques in utilizing the available equipment all along the cereal food line from seed to milling and post-milling stages till the product reaches the consumer. It will consist of well-equipped laboratories, pilot plants, library, class rooms, students' hostel and, above all, an experimental mill which will provide a unique opportunity for the trainees to receive up-to-date, comprehensive and extensive training. It is envisaged that the school will have a capacity to admit 20 trainees per course of 10 months' duration, and as far as possible one-third of these trainees will be from the

countries of south and south-east Asia. The school will be under the administrative control of the Director, CFTRI, but will have adequate autonomy to develop its own programme of training.

In his welcome address, Dr B.L. Amla, Director, CFTRI, disclosed that under the Indo-Swiss agreement the Swiss government would provide practical school mill and laboratory apparatus and instruments amounting to about Rs 41 lakh. Besides, it will provide training for three Indian experts at the Swiss School of Milling and also the services of an expert miller for a year or two. The Government of India will provide full-time and part-time teaching staff, building for the mill, hostel building, ancillary equipment and other service facilities amounting to about Rs 50 lakh. The All India Roller Flour Millers Federation has also agreed to contribute towards the capital investment and to meet part of the recurring expenditure.

Shri Govind Narain, in his address, said that intensive training in flour milling can help cut losses at various stages all along the cereal food line and not only save sizable food resources but also reduce processing cost. There will also be several spin-off advantages of such high-grade training in milling technology.

Thanking the Swiss government, the Swiss Confederation and the authorities of the Swiss Milling School for the generous aid both in the matter of technical guidance and in the supply of equipment, Shri Govind Narain said that the establishment of the school is an outstanding example of active technical cooperation existing between India and Switzerland.

Mr Cart, Regional Programme Coordinator, Swiss Technical Development Cooperation, and Shri M.K. Panduranga Setty, Chairman, Roller Flour Millers Federation of India, also spoke on the occasion.

Jet Curtain Flameholder for Aircraft Afterburners

Afterburning is a method of augmenting the basic thrust of an engine to improve the take-off, climb and combat performance of high-speed aircraft. In this process, additional fuel in the jet pipe is burnt utilizing the unburnt oxygen in the turbine exhaust gas to support combustion. The resultant increase in the temperature of the exhaust gas increases the velocity of the jet leaving the nozzle, thereby increasing the engine thrust.

Since the gas velocities in the jet pipe are very high (120 m/s - 200 m/s), the burning of fuel is possible only with the use of flame stabilizers. The flame stabilizer is generally a V-shaped annular ring located in the jet pipe downstream of the fuel injector. Because of its shape, the flame stabilizer is also called a V-gutter.

The V-gutter requires fairly high blockage in order to satisfy requirements of good combustion stability and efficiency. The high blockage of the V-gutter results in high pressure loss in the jet pipe even when afterburning is not required. Thus, under non-afterburning conditions of flight (typically cruising flight of a supersonic transport aircraft), the high cold-pressure loss leads to an increased specific fuel consumption which adversely affects either the range or the payload. Another limitation of the

V-gutter is its inability to provide variable blockage for thrust modulation.

The National Aeronautical Laboratory (NAL), Bangalore, has developed a new type of flameholder, known as 'Jet curtain flameholder', which overcomes these limitations of the V-gutter. With a view to demonstrating this concept, extensive tests have been carried out on a model afterburner ($150 \times 200 \text{ mm}^2$ section) under simulated conditions of flow parameters. The flameholder is a low-blockage cylindrical tube with two rows of closely spaced holes diametrically opposite to each other. High-pressure pre-mixed air-fuel jets can be injected at right angles to the main stream. These jets form a jet curtain which produces a re-circulatory zone similar to the V-gutter as shown in Figs. 1 and 2. The blockage, i.e. the width of the re-circulatory zone, can be varied by varying the total pressure of the jet. Fig. 3 shows the increase in blockage with increase in jet total pressure. When afterburning is not required, the jets can be cut off and this results in negligible cold-pressure loss because of the presence of a low blockage cylinder. A comparison of the lean stability limits of a 37.5% blockage V-gutter and the jet curtain flameholder shows that the same lean stability limits are obtained if the mixture strengths in the re-circulatory zones are the same. By this the best stability limit is obtained for stoichiometric air/fuel jet. Another incidental advantage is that the surface temperature of the jet curtain flameholder is lower by about 300°C than that of the V-gutter and this means a longer flameholder life. A typical requirement of jet air is about 2% of the main stream at a pressure ratio of 3, which is small enough to be generally available from the compressor in a modern jet engine.

Encouraging results have been obtained in model tests with the jet curtain flameholder and the next step in the innovation chain would be to try it on an actual engine.

Test results show that the system has a promising potential of reducing the dry



Fig. 1—Flow pattern behind V-gutter ($M_\infty = 0.19$)



Fig. 2—Flow pattern behind jet curtain flameholder ($M_\infty = 0.19$, Jet pressure ratio = 2.89)

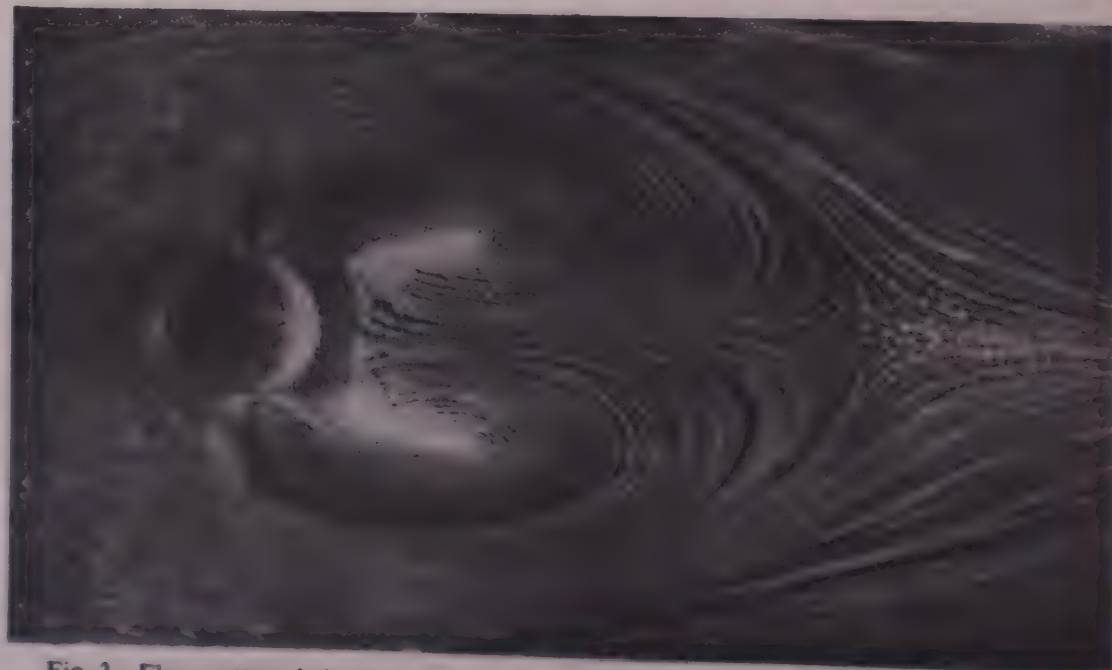


Fig. 3—Flow pattern behind jet curtain flameholder ($M_\infty = 0.19$, Jet pressure ratio = 4.78)

specific fuel consumption of an engine by about 3%, and this can lead to a decrease in all-up-weight of a fighter aircraft by about 10% for a given range. This means that in the case of supersonic transport aircraft the payload can be increased by about 5% wherever the afterburning time is only a small percentage of the total mission time.

Cyclohexane Plant Based on RRL—Hyderabad Process

A one-tonne per day prototype cyclohexane plant designed by the Regional Research Laboratory (RRL), Hyderabad, and based on the process know-how and catalyst developed by the laboratory has been commissioned at the Gujarat State Fertilizer Corporation Ltd (GSFC), Baroda. The plant converts benzene into cyclohexane, a basic raw material in the manufacture of nylon 66. Presently, GSFC is producing cyclohexane using imported catalyst.

Under the collaborative arrangements between the laboratory and GSFC, the laboratory has also participated in the commissioning of the prototype plant. The process, catalyst and plant are comparable in performance with imported commercial plant and catalyst. GSFC envisages the setting up of a commercial plant for cyclohexane to be jointly designed by RRL and GSFC on the basis of the RRL know-how.

It is expected that future expansion of GSFC for cyclohexane will be based on the indigenous process know-how and design. It will also be possible to enter the export market for this technology which is in good demand.

Anticorrosive Treatment of Steel Reinforcement Rods

CECRI PROCESS UTILIZED AT PAMBAN BRIDGE

At the request of the Pamban Bridge Authorities, the Central Electrochemical Research Institute (CECRI), Karaikudi, has worked out an integrated process for anticorrosive treatment of steel reinforcement rods in marine environment. The feasibility of the

treatment has been successfully established at the bridge site. The processes relating to the preparation of the products involved in the integrated process have now been released to the bridge authorities for captive use in their construction. These processes as well as the integrated process recommended are labour-intensive and can employ locally available unskilled labour.

The integrated process consists of four stages: (i) derusting, (ii) phosphating, (iii) brushing two coats of inhibited cement slurry, and (iv) sealing. The products required in the integrated process are: (i) acid inhibitor in solid form (Indian Pat. 465/Cal/75), (ii) rust preventing composition (Indian Pat. 109897), (iii) composition for corrosion prevention in reinforced concrete and brick work construction (Indian Pat. 109784/67), and (iv) portland cement coating for steel (Indian Pat. 112440/67).

The products are being prepared at the construction site since August 1977. Recently, the know-how has also been released to the Maharashtra State PWD.

Indigenous Instant Tea by Tocklai Scientists

Some instant tea samples with an excellent quality of brew have been manufactured for the first time with indigenous technology at a pilot plant at the Tocklai Experimental Station, Jorhat, of the Tea Research Association, Calcutta. In two factories in South India which use foreign technology, the poor quality of the product has been the main problem in instant tea production. This problem has been successfully overcome in the Tocklai process. The cup quality and aroma of the brews of instant tea samples produced in the Tocklai plant are indistinguishable from the brews of good-quality orthodox teas, according to the tea tasters. The Tocklai process is based on the upscaled bench process developed at the University of Calcutta under a Tea Board scheme.

The team of project scientists at Tocklai are now engaged in collecting engineering and processing data to

finalize a blueprint for commercial production of hot- and cold-soluble instant teas for markets at home and abroad. Modern management techniques (PERT and CPM) are now being used for monitoring the progress of research and early completion of the blueprint for setting up an instant tea commercial plant with indigenous technology and machinery.

Global Study on Slow Sand Filtration

NEERI COMPLETES PHASE I OF WHO IRC PROJECT

The National Environmental Engineering Research Institute (NEERI), Nagpur, has completed a two-year study on the first phase of the International Research and Demonstration Project on Slow Sand Filtration under the sponsorship of World Health Organisation International Reference Centre (WHO IRC).

A report on the first phase of the project was also submitted by NEERI. The 126-page report gives a comprehensive review of pilot-scale experiments to study the effect of different rates of filtration, shading, discontinuous operation, high levels of pollution in raw water, and the use of builders' grade sand on the performance of slow sand filters. Based on the results, design criteria for slow sand filters suitable for small community water supplies have been outlined. A typical design for such a scheme is included in the report.

The report also describes a field study on the performance and management of the slow sand filtration plant at Umrer in Maharashtra. It also contains information on the physical and bacteriological efficiency of the filters, operation and maintenance and financial management of the scheme, and the consumers' opinion of the water supply and the impact on the health status of the community. The main features of 187 slow sand filter installations in India are listed and statistical analysis of the data is given.

The primary purpose of the project is to demonstrate the suitability of slow

sand filtration and to promote its application in tropical developing countries of the world which need a simple, reliable and appropriate method of water purification for small communities.

The sponsor, WHO IRC, provided financial assistance to the tune of \$ 12,000 to NEERI for the first phase, which was launched in early 1976 and completed in December 1977. The second phase of the project involving village demonstration plants has just started.

Oil Pollution in the Arabian Sea

The research vessel *Gaveshani* of the National Institute of Oceanography (NIO), Goa, during its 35th cruise surveyed a part of the oil tanker route, along the 5°30' N latitude from south of Sri Lanka to the mouth of the Strait of Malacca up to the 85° E longitude. The whole route was full of floating and particulate tar residues with concentrations ranging from 0.5 to 3.6 mg/m², a fairly high amount in comparison with those of the other areas of the world. Combining these observations with those made during the 31st cruise of *Gaveshani* in the Laccadive Sea, it can be concluded that the entire oil tanker route from the Gulf ports to the Far East and Japan, across the Arabian Sea, is greatly polluted with dissolved petroleum hydrocarbons ranging from 20 to 27 µg/litre in concentration.

Water Spout in the Bay of Bengal

During the 36th cruise, while the research vessel *Gaveshani* was on its way from Madras to Calcutta, a rare phenomenon was observed. At about 18°28' N latitude and 84°43' E longitude a water spout rising from 10 to 15 m in height and with about 100-200 m diam. was sighted. The time was around 0945 hrs and the sky was clear and sunny. Water spouts are the results of the occurrences of tornados at sea and are very rare.

Display Room of CMERI Inaugurated

A display room of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, was opened on 14 July 1978. CMERI's achievements are displayed through models, photographs and charts under the following sections: Air-conditioning and refrigeration systems; Combustion equipment and systems; Farm machinery; Fluid handling machinery; IC engines and automobile ancillaries; Industrial machinery; Machine tools; Technology for rural/small industries; Transport equipment; Quality control equipment and facilities; and Welding equipment and facilities.

Shri Chittabrata Majumdar, Minister of Cottage and Small Scale Industries, Government of West Bengal, inaugurated the display room.

Engineering Dimensional Metrology Course

A one-week course on engineering dimensional metrology was conducted jointly by the Central Mechanical Engineering Research Institute, Durgapur, and the Mechanical Engineering Research and Development Organisation, Pune, from 17 to 22 July 1978 at Pune. Twenty-eight participants from various industries attended the course, which covered, through lectures and demonstrations, topics like limits and tolerances; length, angle, screw threads and gear metrology; errors of measurements and their treatment; SQC methods; and current developments and trends.

Deputation Briefs

Shri S.N. Agarwal, Senior Librarian, Industrial Toxicology Research Centre, Lucknow, visited USA and Japan for six months from September 1977 to March 1978 for training in medical librarianship on a WHO fellowship.

During the course of training, Shri Agarwal spent eight weeks each at the National Library of Medicine (NLM), Bethesda, Maryland; University of

Washington Medical School Library, St Louis, Missouri; and Washington State University Health Sciences Library, Seattle, Washington. Shri Agarwal worked in the various sections of these libraries and took special interest in the Toxicology Information Programme of NLM, and the use of Medical Subject Headings (MeSH) in the Medical Literature Analysis and Retrieval System (MEDLARS). Shri Agarwal also visited several other special libraries.

While in Japan, Shri Agarwal visited the National Diet Library and the Japan Information Centre of Science and Technology (JICST) in Tokyo.

PHYSIOLOGICAL AND BIOCHEMICAL ACTIONS OF GONADOTROPINS

BHATNAGAR PRIZE-WINNER PROF. MOUDGAL'S WORK*

Prof. N.R. Moudgal has been engaged, since 1958, in research in endocrinology, and more recently in reproductive biology. His main interest has been the study of the physiological and biochemical actions of gonadotropins at the cellular and molecular levels using an immunologic approach. With this in view, he developed a powerful investigative tool—that of producing antibodies to luteinizing hormone (LH) and follicle stimulating hormone (FSH), and evolving methods to characterize them for specificity to obtain neutralization of a single hormonal activity at a given time. Using these specific antibodies, it was possible to determine the relative involvement of FSH and LH in various gonadal processes.



*Prof. N.R. Moudgal of the Department of Biochemistry, Indian Institute of Science, Bangalore, has been chosen for the Shanti Swarup Bhatnagar Prize in medical sciences for 1976 [CSIR NEWS, 28(1978), 113].

Using antibodies to LH, Moudgal's group was able to unequivocally demonstrate first in small laboratory rodents, such as rats and hamsters, that LH is the principal luteotrophic hormone and that deprivation of LH even for short periods causes luteolysis in pregnant animals, leading to termination of pregnancy. Extending this knowledge to primates, he and his co-workers showed in bonnet macaques that injection of homologous antiserum to LH of a heterologous species (e.g. whole LH of sheep or its β -subunit) during the first week of missed menstrual period results in termination of pregnancy. Since this method involved only a passive transfer of sera within the same species, no undesirable immunological sequelae were found. This treatment was shown not to have any permanent effect on the reproductive capacity of the female during subsequent periods. Based on all these experiments, Moudgal suggested that it should be possible to produce antibodies to heterologous LH in donor humans (e.g. employing post-menopausal women), isolate specific antibodies which cross-react with human chorionic gonadotropin and LH, and use them to bring about medical termination of unwanted pregnancy, or in other words, menstrual regulation, in women during the first few weeks of a missed period. Since raising antibodies to LH in humans was thought to cause ethical problems, more recently he has concentrated his efforts to find ways and means of raising antibodies in an animal species (a primate close to humans), and after ensuring that the gamma globulins so obtained are immunologically compatible with human immunoglobulins and that these antibodies do neutralize the activity of hCG and LH, to use them as an early abortifacient in women. The last few experiments, still under way, hold promise of developing a potential contraceptive.

Essentially concerned with basic studies, Moudgal has been interested in studying the mechanism of interaction

of hormone with its receptor. With the advent of radioimmunoassays to measure hormones in biological materials, Moudgal and his co-workers adopted this method after suitable modification to measure receptor-bound gonadotropin and thus evolved a new method of studying hormone receptor interaction. These studies have shown that this interaction is a highly specific, saturable and reversible process, which is correlatable to a specific response. Recently, his group has observed that the β -subunit of LH although biologically inactive, is recognized by the LH receptor and by virtue of this interaction is capable of inhibiting response to intact LH.

Another field of Prof. Moudgal's interest has been the study of mechanisms causing gonadal quiescence during lactation. It was shown first in the rat model system and later in the monkey that during this state, there is an inverse relationship between prolactin and gonadotropins and that injection of exogenous prolactin to animals with minimal suckling stimulus causes an inhibition of release of LH from the pituitary, the latter being responsible for the non-occurrence of follicular development and ovulation in these animals during this physiological state. Periodic injection of prolactin or a drug like chlorpromazine, which causes an increase in endogenous prolactin levels, to lactating monkeys resulted in the postponement of their return to cyclicity. Based on this, it was suggested that if ways and means are devised to increase endogenous prolactin levels at critical periods from the third month of lactation, this may lead to prolonging the period of lactational amenorrhea in women and thus help space children.

Another area of research in reproductive biology, where Moudgal's group has made considerable contribution, is the understanding of the role of FSH in spermatogenesis in adult males. By passive immunization of adult male monkeys of proven fertility with characterized and homologous antibodies to FSH, it was shown that lack of

FSH for prolonged periods does affect fertility of the monkeys without having any effect on their libido. His group is now engaged in studying the biochemical changes in testis and epididymes in these monkeys following chronic treatment with antiserum to FSH.

His research group is making headway also in studying a testicular protein named 'inhibin', which is proposed to be the testicular factor involved in regulation of secretion of FSH in the male. Attempts have been made to isolate and characterize this material from the sheep testis. This necessitated evolution of simple and rapid bioassays for measuring the activity of this material. It has been shown by his group that injection of inhibin from ovine testis to rats, mice and monkeys results in a significant suppression of FSH for short periods. Whether it is possible to affect the fertility of the male using this material, thereby offering a method for male contraception, is yet to be seen.

A native of Bangalore, Prof. Moudgal had his early education at Bangalore and his graduate and post-graduate education at Bombay and Madras. He worked for his Ph.D. with the late Prof. P.S. Sarma at Madras University and carried out post-doctoral work with Prof. C.H. Li at University of California, Berkeley, and as a Wellcome Trust fellow in London for a short period with the eminent immunologist Prof. R.R. Porter.

Prof. Moudgal was awarded the National Fellowship by the University Grants Commission in 1975 for a period of two years. He is the recipient of an award of the Union Ministry of Health & Family Planning for best research in biomedical sciences. He was elected Fellow of Indian Academy of Sciences in 1975. He is the recipient of Sreenivasaya Memorial Award (1978) of the Society of Biological Chemists, India, for research contributions in biochemistry and allied sciences.

Prof. Moudgal is the chairman of the editorial board of the experimental biology section of *Proceedings of Indian*

Academy of Sciences. He has been associated with a number of scientific bodies in various executive capacities, including the WHO Task Force and has participated in many national and international conferences over the years.

Prof. Moudgal has more than a hundred publications to his credit.

PROGRESS REPORTS

NIO Annual Report: 1977

The annual report of the National Institute of Oceanography (NIO), Goa, for 1977 shows that the institute laid maximum emphasis on the utilization of its technology. Work on 18 institutional projects was continued. The newly formed regional centre at Waltair and the Ocean Engineering Division at the headquarters were further strengthened to undertake R&D work. Sponsored investigations (18) carried out during the year fetched a total revenue of Rs 54 lakh, which amounted to about 30% of the laboratory's annual budget.

The institute participated in the activities of the Intergovernmental Oceanographic Commission of Unesco and the United Nations Environment Programme.

NIO's research vessel *Gaveshani* completed 14 cruises during the year. Nine cruises were undertaken for the in-house R&D projects and five, for sponsored projects. During these cruises, the ship covered more than 18,000 line-km and worked at 430 stations in the Arabian Sea and the Bay of Bengal.

Cruises in the Arabian Sea were concerned with: (i) pollution studies along the west coast from Bombay to Trivandrum; (ii) detailed sampling of sediments (coring, dredging, grab, snapper samples) from 175 stations in the continental shelf from Mormugao to Cape Comorin and from 139 stations in the continental shelf and slope from Vengurla to Mangalore; (iii) rectification of the defects in the satellite navigation system; and (iv) survey of the pipeline route from Bombay High to Bombay. Cruises in the Bay of Bengal were devoted to: (i) physical, chemical and

biological oceanography from Calcutta to Machilipatnam; (ii) testing of the newly installed ship-borne wave recorder and the stabilization tanks of *Gaveshani*; and (iii) pollution studies from Visakhapatnam to Cape Comorin and enroute to Mormugao.

The special feature of the work in physical oceanography were: (i) installation of a sophisticated wave recording instrument (ship-borne wave recorder) on R.V. *Gaveshani* and collection of valuable wave data from the Arabian Sea and the Bay of Bengal; (ii) recording of continuous profiles of salinity and temperature against depth (up to a depth of about 1200 m) in the seas around India during the cruises of *Gaveshani* using the newly installed CSTD (conductivity, salinity, temperature and depth measuring) system; and (iii) designing of two prime mover systems for the shore protection through wave energy utilization and testing of these systems in the field to study the performance under actual wave conditions. Based on the field tests, further development in the design was being carried out.

Investigations in chemical oceanography were concerned with: distribution and inter-relationship of inorganic and organic constituents of the estuarine, coastal and offshore waters along the east and the west coasts of India; chemistry of pharmacologically active components of marine plants and animals; and design and improvement of solar desalination units.

Extracts from 50 marine organisms were subjected to pharmacological screening. Ten of these showed promising results as CNS stimulating, diuretic, anti-inflammatory, hypotensive, spasmogenic, antiviral, antifertility and highly toxic agents. Cholesterol was found to be the major constituent of the alga *Gracilaria corticata*.

In geological oceanography, projects pursued were: (i) geological and geophysical surveys to assess the petroleum and mineral prospects of the western continental margin of India; (ii) geochemistry of the sediments of the

western continental margin of India; (iii) sediments of the western continental margin of India; and (iv) foraminifera as indicators of high organic carbon and pollution in the marine environment. A sediment distribution map of the Gulf of Kutch was prepared. A live coral bank named 'Gaveshani Bank' was discovered off Mangalore at a distance of 100 km from the coast at a depth of 80 m.

Major projects in biological oceanography related to: (i) studies on primary, secondary and tertiary levels of the food chains; (ii) coastal aquaculture; (iii) biogeography of the zooplankton of the Indian Ocean; and (iv) ecological, developmental and experimental studies on plankton. Rope culture of green mussel (*Mytilus viridis*) on floating rafts in waters of Goa was found economical even on a small scale because it gave a high return of 181%. Laboratory experiments showed that larvae of giant prawn *Macrobrachium rosenbergii* could be best cultured in 15‰ salinity. The diet of egg-custard was found to be the most preferred food by the larval stage.

An electromagnetic current meter was developed, calibrated and successfully tried in the field. An electronic sedimentation balance was developed for weighing accurately and instantaneously the sediments settled at the bottom of a long settling tube. The information recorded on a strip chart recorder against time gives the total quantity of settled material which indirectly gives the properties of the material such as rate of settlement, and size and quantity of particles.

Sponsored projects completed by NIO include: studies on beach stability and nearshore environment at Sinquerim; oceanographic studies off Mangalore coast; hydrographic survey of Karwar; wastewater disposal and submarine outfall studies in marine environment around Bombay; environmental studies in relation to beach erosion at Thumba; survey of submarine pipeline route from Bombay High to Bombay (phases II & III); soil sampling and testing including study on stability of pipeline from Bombay to Bombay



High; side scan sonar survey for Zuari-Agro Chemicals effluent pipeline in the Cola Bay, Goa; pollution control master plan for Kolak and Damanganga River basins (phases I & II); and hydrographic and pollution survey of Par River.

Consultancy services were provided

to the Government of Andhra Pradesh for the development of a dolphinarium and marine land complex at Visakhapatnam and to the World Wild Life Fund, Bombay, for the development of a marine park at the Pirotan and Deda Islands in the Gulf of Kutch.

recent origin in the field of preparative chemistry. In this method a precipitate is obtained by means of an *in situ* reaction taking place in a homogeneous solution containing the ingredients of the precipitate. After mixing the reagents under homogeneous conditions, the experimental conditions are altered in such a way that precipitation takes place gradually from the solution. The precipitates obtained by this technique are dense, evenly granular, well-defined, and easily filterable. Such materials, which are purer in composition and have uniform particle size, are often required in industry. One such area is catalyst preparation where the physical characteristics are of prime importance.

This patent relates to a process developed for the preparation of iron oxide – chromium oxide catalyst for high-temperature shift conversion by precipitation from homogeneous solution wherein salts of iron(II) and chromium(VI) are simultaneously oxidized and reduced to iron(III) and chromium (III) respectively in the presence of very small quantities of nitric acid. After dilution, a sufficient quantity of urea is added and the system is heated on a water bath with constant stirring till the precipitation is complete. The precipitate is filtered, washed, and dried at 120°C. The sample thus obtained possesses good catalytic activity for shift conversion.

A feature of the process is the simultaneous oxidation of iron(II) to iron(III) and reduction of chromium(VI) to chromium(III). The precipitates obtained are easily filterable and can be dried even under water suction. Also, there is considerable saving in time in filtration and drying steps as compared to the conventional ammonia method.

Indian Pat. 1482/Cal/75

Improvements in or relating to the electrolytic reduction of *o*-nitrophenol to *o*-aminophenol
H.V.K. UDUPA & P.N. ANANTHARAMAN
Central Electrochemical Research Institute, Karaikudi

o-Aminophenol is prepared from *o*-nitrophenol by chemical or electrochemical reduction. In the chemical

CSIR SUPPORT TO RESEARCH

Immunity in Amoebiasis

Amoebiasis is fairly common in this country and incidence of this infection varies from 10 to 15% amongst apparently healthy subjects. The pathogenesis of this infection is not very clear. It has been observed that circulating antibodies which are elicited due to amoebic infection fail to protect the individuals from re-infection. In any mixture of antigenic substances, certain proteins, either due to their composition, chemical nature or molecular weight, stimulate high levels of antibodies while the other proteins stimulate lower levels. Such proteins might be protective in nature.

In a new CSIR research scheme granted to him, Dr V.K. Vinayak, Assistant Professor and Head, Division of Experimental Parasitology, Department of Experimental Medicine, Post Graduate Institute of Medical Education and Research, Chandigarh, proposes to isolate an antigenic determinant of axenically grown *Entamoeba histolytica* (NIH:200) which might have the potential to function in a protective manner. The protective values of each fraction will be studied in guinea pigs. The study is expected to highlight the use of such a fraction of antigen that could be employed as vaccine for amoebiasis and would be helpful in prevention and treatment of amoebic infection in human beings.

Utilization of Mica Dust Waste as a Source of Potassium for Fertilizers

In a new CSIR research scheme granted to Dr Kunal Ghosh, Lecturer in Agricultural Chemistry, University of Calcutta, Calcutta, it is proposed to

utilize mica dust waste as a source of potassium for fertilizers.

It has been well established that potassium is one of the three main plant nutrients. In spite of its increasing use, potassium fertilizers are not manufactured in India and all requirements have to be met by imports, which in 1971-72 amounted to more than 3.6 lakh tonnes. The target consumption for 1978-79 is about 5 lakh tonnes and that for 1982-83 is 7.2 lakh tonnes.

India has the largest deposits of muscovite, the K₂O content of which may be as high as 11.8%. Moreover, mica dust is considered a useless material and in addition poses a disposal problem. Hence, its utilization will doubly economize the process. Attempts have already been made to apply mica directly to plants as a source of potassium, but the results reveal that the rate of release of potassium is very slow and the quantity insufficient. Mica is also known to cause detrimental effects on the physical properties of soil. Therefore, effective utilization of mica as a source of potassium is possible only after the breakdown of the crystals.

The proposed experiments, if successful, will lead to the establishment of potash-fertilizer plants in the country. This will not only save huge imports, but, considering India's mica reserves, may also facilitate exports.

PATENTS ACCEPTED

Indian Pat. 1413/Cal/76

A method for the preparation of iron oxide—chromium oxide catalyst by precipitation from homogeneous solution

J. RAJAGOPALA RAO & B.R. SANT
Regional Research Laboratory, Bhubaneswar

The technique of precipitation from homogeneous solution is of relatively

method, wherein iron and hydrochloric acid are used for reduction, the product isolation becomes more difficult because of the complexing of the phenol with iron. More steps are involved in the process than in the direct electrochemical reduction. Vapour-phase reduction has also been tried but it requires the use of expensive catalysts.

In the improved process, covered by this patent, electrolytic reduction of *o*-nitrophenol to *o*-aminophenol is carried out in a supporting electrolyte of sulphuric acid solution with an addition agent, titanous sulphate. The titanous ion, used in a very small quantity as an intermediary ion, gets reduced to titanous ion at the cathode and this in turn reduces the nitro compound chemically, thus getting itself oxidized to titanous ion again. The titanous ion gets reduced to titanous ion again at the cathode surface and the cycle repeats. Since the titanium salt concentration remains unaltered the reduction is very smooth and complete. The low solubility of *o*-nitrophenol is not a problem as it will get reduced to *o*-aminophenol under stationary electrode conditions and this simplifies the cell assembly. As container a copper vessel is used which acts as a cathode. Moreover, the vessel is a good conductor of heat and will enable maintenance of the temperature within a narrow limit. After reduction, *o*-aminophenol sulphate can be salted out and the electrolyte can be used subsequently. By this technique, the alkali for neutralization is minimized, and since the reduction of *o*-nitrophenol is complete, another unit process, viz. removal of *o*-nitrophenol by steam distillation, is saved. Very pure *o*-aminophenol can be obtained by recrystallizing *o*-aminophenol sulphate before neutralizing it to liberate the free base *o*-aminophenol.

o-Aminophenol is obtained in more than 90% yield and is of 99% purity, with an energy consumption of 6.8 kWh/kg of the product.

o-Aminophenol finds use in photographic, dye and pharmaceutical

industries, and the annual demand for the chemical exceeds 300 tonnes.

PERSONNEL NEWS

Appointments/Promotions

Consequent on assessment, Shri Didar Singh of the Publications & Information Directorate, New Delhi, has been promoted as Art Officer (30 Nov. 1977).

Consequent on assessment, the following have been promoted at the National Chemical Laboratory (NCL), Pune:

As Scientist EI

Dr U.R. Nayak (1 Jan. 1977); Dr P.G. Sharma (30 April 1977); Dr C.G. Joshi (6 July 1977); Dr G.V. Potnis (21 Sep. 1977); Dr V. Damodaran (28 Sep. 1977); and Dr A.S. Gupta (18 Nov. 1977).

As Scientist C

Shri J.V. Rajan (28 Nov. 1977); Shri S.R. Modak (22 Sep. 1977); Dr V.K. Powar (22 Sep. 1977); Dr K.V. Krishnamurthy (1 Jan. 1978); Shri M.B. Mahajan (23 Aug. 1976); Shri H.G. Vadgaonkar (1 April 1977); Shri R.K. Sen (19 June 1977); Shri J. Lobo (23 Sep.

1977); Dr V.G. Neurgaonkar (23 Nov. 1977); Dr S. Krishnappa (5 April 1977); Dr V.H. Kapadia (28 March 1977); and Dr H.R. Sonawane (1 Oct. 1977).

As Scientist A

Shri B. Seetharama Rao (17 April 1977); Shri S.S. Joshi (22 Dec. 1977); Shri I.C. Gouroji (24 Feb. 1977); Shri H.P. Khadilkar (24 Feb. 1977); Shri B.A. Baliga (24 Feb. 1977); Dr P.N. Choudhary (24 Feb. 1976); and Shri A.Y. Sonsale (17 April 1977).

Others promoted at NCL include: Shri N. Sadasivan (as Scientist C; 16 May 1978); Shri M.B. Shinde (as Scientist B; 16 May 1977); and Shri M.N. Joglekar (as Scientist A1; 24 March 1977).

The following personnel have been appointed as Pool Officers at NCL, Pune: Shri V.P. Saxena (15 June 1978); and Dr (Miss) B. Subramanian (26 June 1978).

Transfers

Dr (Mrs) M. Lalithambika of NCL, Pune, has been transferred to the CSIR Trivandrum Complex (23 June 1978).

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 17/78

It is proposed to appoint a Scientist F as the Secretary, Indian National Committee for International Hydrological Programme (IHP) in the Council of Scientific and Industrial Research, New Delhi.

Job Requirements: The IHP is a major international programme of Unesco designed to improve the understanding of hydrological processes, assessment and scientific management of water resources in each country by fostering better education, training and R&D facilities. Towards implementation of its decisions the Secretary would assist the Committee in planning, formulating and coordinating scientific hydrology programmes undertaken by the national institutions, governmental agencies and liaise their activities in the development of newer technology and hydrologic research. It has to enable the Committee to provide the required thrust to hydrologic education, training and research activities of the country. On behalf of the Committee, he has to liaise with the UN bodies in their water resources programmes, especially Unesco's programme, as well as other national committees dealing with water sciences and process hydrologic data/information for international exchanges.

Qualifications/Experience: The candidate should hold at least first class master's degree in science or master's degree in civil engineering. He should be capable of providing leadership to the team of scientists and engineers through his specialized and interdisciplinary knowledge in handling hydrologic problems so as to perform the tasks indicated above.

(Desirable): Doctorate degree in science or engineering.

Salary/Conditions of Service: The salary scale attached to the post would be Rs 2000-1252-2500. The post is temporary, but likely to be continued.

Age Limit: Below 50 years, relaxable in the case of deserving candidates.

Persons interested may obtain two copies of the standard proformae for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. The completed *curriculum vitae* proformae must be received in this office on or before 2 November 1978.

Canvassing in any form and or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

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Asian Network for Technology Transfer

Representatives from ten countries of South and South East Asia including India have recommended the establishment of an Asian Network for Technology Transfer in Agro-Industries.

This recommendation was unanimously adopted at the concluding session of the Technical consultation among developing countries for technology transfer to develop food and agricultural products conservation and processing industries'. The consultation was organized by the United Nations Food and Agriculture Organization (FAO) from 7 to 15 August 1978 at the Central Food Technological Research Institute (CFTRI), Mysore, with the financial support from UNDP. The Government of India was the host.

The ten countries which were represented at the consultation included Afghanistan, Bangla Desh, Burma, India, Indonesia, Korea, Malaysia, Nepal, Philippines and Thailand. Besides, representatives from invited institutions in Nigeria, Mexico and India and of UN agencies like UNIDO, UNDP, UNU and ESCAP attended.

It is envisaged that the Asian network organization will consist of representatives of institutions from each participating country and will also be open to other countries of the region. It will be responsible for planning, coordination and follow-up of work programmes, and for training of manpower in respect of assessment, selection, transfer and development of technologies.

FAO is expected to initiate action for the creation of the proposed network,

and other UN agencies such as UNCTAD, UNIDO and ESCAP may also be associated. Financial support for the Asian network would be sought through UN agencies, multi-bilateral programmes, and mutual assistance from the countries of the region.

Immediate steps are expected to be taken by FAO to survey the facilities in national institutions so as to make the best possible use of existing institutional competence or to create new ones.

It was stressed that greater recognition should be given to the development of agro-based industries by all the countries in the region as it can contribute to increasing the share of developing countries in industrial production and to speeding up socio-economic progress. In national planning it is essential to have an integrated approach to the entire system of agricultural production, post-harvest technology, marketing and training. It was pointed out that fragmentation within the system has been a major obstacle to the development of food and agricultural products conservation and processing industries.

There was a general consensus on the urgent need to establish and strengthen national capabilities, where they exist, in each country of the region for transfer of technology, research and development and for training of manpower at national level so as to speed up the pace of development of food and agricultural products conservation and processing industries. Where facilities do not exist, efforts should be made to build new ones, through a systematic programme of regional technical cooperation.

It was recommended that competent bodies should be established at national level to formulate, coordinate and implement policies for assessment, selection, transfer and utilization of appropriate technologies. They should also coordinate the programme of technology transfer within the country.

Long-term courses on manpower training are recommended to be organized at institutions having adequate facilities. As a first step the training programme at the FAO International Food Technology Training Centre at CFTRI is to be continued and strengthened. FAO is to take immediate action to organize programme to train institution-builders, leaders of research and development, and trainers, in cooperation with other UN agencies, specially the United Nations University.

These recommendations emerged after a thorough discussion of the status reports of agro-industries development in each country, prepared by competent consultants appointed by FAO for each country, in consultation with the respective governments. These reports have been useful to have a picture of the constraints to the development of agro-industries, priorities needed for the development of specific sectors, capabilities available within the participating countries, and the institutes working in different areas of food and agricultural conservation and processing.

Workshop on Village Artisans and Science

A five-day workshop on 'Gaon ke Karigar aur Science' (Village artisans and science) was organized in the rural surroundings of Sevagram (Wardha)

during 7-11 September 1978 by the Management Development Unit of the Planning Division of CSIR, New Delhi, and the Centre of Science for Villages, Wardha. The purpose of the workshop was to build rapport between the artisans and scientists and to identify areas where the scientists could make further in-depth study of definite problems, suggest solutions and draw up projects for finding technologies to solve these problems.

Twenty-one scientists from nine national laboratories, 28 promoters and 16 artisans in the areas of food processing industries, leather technology, village pottery, carpentry, blacksmithy, rural civil engineering, habitat, environment and energy attempted at diagnosing the scientific and technological problems in furthering rural industrialization.

Inaugurating the workshop on 7 September, Shri Annasaheb Sahasrabudhe said that the rural artisans had much to contribute to the expertise of scientists working in the national laboratories and suggested a viable plan for rural industrialization on the basis of application of science and technology and improvement of the technical base of rural industries.

The participants, who were grouped in five industrial areas, arrived at the following key recommendations:

1. A centre of pottery, where field trial can be undertaken, be established in Wardha to assist the local artisans in improving the techniques for making best use of the local raw materials.

2. The Central Food Technological Research Institute (CFTRI), Mysore, should propagate the process in which a mix of cereals and pulses could be nutritively prepared and their acceptability vouchsafed.

3. A field trial be made, with demonstration and dissemination, for producing quality gur and jaggery in and around Wardha.

4. CFTRI should undertake studies to prepare peptin from papaya in the district Wardha in such a way that the nutritive value of the fruit is not affected.

5. The Central Leather Research Institute (CLRI), Madras, should provide facilities for training the village tanners in the areas of processing and utilization of leather. The Khadi and Village Industries Commission was requested to organize the training programme.

6. The Central Mechanical Engineering Research Institute, Durgapur, and Yantra Vidyalaya, Bardoli, may draw up short courses of two to three weeks on carpentry and blacksmithy and the artisans of Wardha and the adjoining regions could be deputed to update their knowledge for making tools.

7. An experiment to improve the environment in Sevagram village be conducted by the National Environmental Engineering Research Institute (NEERI), Nagpur, through the installation of improved toilets and drainage systems.

8. Techniques of safe water supply available with NEERI or other organizations could also be tried in Sevagram and the results analyzed for their degree of replicability.

9. The Structural Engineering Research Centre, Madras, should extend its techniques for ferrocement and domeless biogas processes for use in Sevagram.

The participants visited the rural industries in and around Wardha to study the problems of the rural artisans.

The promoters in the workshop drawn from agencies like Khadi and Village Industries Commission, Appropriate Technology Development Association, Jamna Lal Bajaj Centre of Research of Industries, Gramodyog Sangh, Yantra Vidyalaya, etc. pointed out the problems concerning the actual state of technology in which the village artisans were working. The CSIR scientists gained a new understanding on the need of the local artisans which could be juxtaposed with the new areas of thrust in choosing their research programmes.

Scientists present in the workshop made the promoters and artisans aware of the studies being carried out in the

national laboratories and solved some of their problems on the spot.

There was a visible impact on the artisans present in the workshop. The artisans made an effort to understand the solutions of some of their intricate problems for making their products economical. The promoters, who are qualified persons in the field of transfer of technology to the actual users, i.e. village artisans, gained considerable experience from discussions with the scientists.

Commercialization of NCL Technologies

Potentiometric Strip Chart Recorder: Chromatography and Instruments Company, Baroda, have started production of potentiometric strip chart recorders based on the know-how developed at the National Chemical Laboratory (NCL), Pune. During 1977-78 the firm produced 75 units, valued at Rs 8.25 lakh. This is the second firm to implement this technology besides Elico Pvt Ltd, Hyderabad, who are manufacturing potentiometric strip chart recorders based on the NCL know-how since 1976.

Potentiometric strip chart recorder designed by NCL is a versatile unit and is capable of being used in conjunction with VPC; NMR, EPR, IR and UV spectrometers; polarographs; etc. Other applications are for differential thermal analysis, monitoring and control of temperature in ovens and furnaces, flow rates, level, pressure, pH, humidity, etc. in industrial process control.

Polyurethane Coatings: Cipy Chemicals, Pune, and Polyurethane Industries, Ahmedabad, have started production of polyurethane coatings based on the NCL know-how for the first time. The polyurethane coatings developed by NCL can be used for leather, rubber, wood, glass and metal substrates. The coating gives excellent adhesion hardness and flexibilities. Cipy Chemicals and Polyurethane Industries have produced 100 litres and 500 litres respectively of polyurethane coatings.

Nitromusk Compounds: Opal Fine Chemicals, Bombay, have recently commenced production of musk xylol based on the NCL process specifically developed for the party on sponsored basis. Musk xylol is a perfumery chemical and is mainly used as a perfumery ingredient in soaps. The firm has produced 200 kg of musk xylol, valued at Rs 16,000.

Oxalic Acid from Bark of Ain Tree: Vidarbha Organic Chemical Industries Ltd (VOCIL), Chandrapur, have started regular production of oxalic acid from Ain tree (*Terminalia tomentosa*) bark based on the NCL know-how. The process was specifically developed for the party on sponsored basis. VOCIL produced, during 1977-78, 179 tonnes of oxalic acid, valued at Rs 12.75 lakh.

p-Toluidine from p-Nitrotoluene: Sudarshan Chemical Industries Ltd, Pune, have commenced production of p-toluidine from p-nitrotoluene based on the catalytic vapour phase reduction process developed at NCL for the firm on sponsored basis. The firm, during 1977-78, produced 4 tonnes of p-toluidine, valued at Rs 1.05 lakh. p-Toluidine is used in dyes and organic syntheses.

NCL Processes

Demonstrated to Licensees

Silver Paste for Mica Capacitor Electrodes: The process for the manufacture of silver paste for mica capacitor electrodes, developed at the National Chemical Laboratory (NCL), Pune, was demonstrated to the representatives of Ramans (India), Ambala City, and Jyoti Refineries, Nagpur. At present, this type of silver paste is being imported. The indigenous manufacture of the paste is expected to enhance the production of mica capacitors which find use in electronic circuits of radio and television and other professional electronics.

Carboxin: The NCL process for the manufacture of Carboxin, a systemic fungicide, was demonstrated to the representatives of Bharat Pulverising

Mills Pvt Ltd, Bombay. This is the second party to acquire this NCL technology. Carboxin is mainly used for the seed treatment of cereals against smuts and bunts. It is highly specific and effective against pathogens and does not injure the hosts.

Dimethoate: The NCL process for the manufacture of dimethoate was demonstrated to the representatives of P.N.M. Company, Erode. This is the first party to acquire this technology for commercial implementation. Dimethoate is an organophosphorus pesticide used widely in India for effective control of a wide range of insects and mites on many vegetables, wheat, sorghum, cotton, apples, pears, safflowers, lemon, oranges, grapefruit, ornamental plants, etc.

Nitrofen: The NCL process for the manufacture of nitrofen was demonstrated to the representatives of Amar Dye Chem Ltd, Bombay. This is the second party to acquire this process for commercial implementation. Nitrofen is an important modern herbicide, which has been found specially useful for groundnuts, sugarcane, sorghum, etc.

NIO Installs Wave-Rider Buoy in Goa

The National Institute of Oceanography (NIO), Goa, has installed a wave-rider buoy at the Zuari River mouth for collecting continuous data on sea waves. The buoy is placed at about 1.7 km south-west of Dona Paula Jetty at a water depth of about 10 m.

The buoy system consists of two parts. The first part contains a stainless steel spherical buoy (wt, c 100 kg) with all its electronic devices securely placed within a water-tight shell. The buoy, anchored to the sea-bed by a suitable mooring system, follows the movements of the waves. At night it gives three flashes of high intensity per minute and these can be easily detected in the dark.

The second part of the system consists of an antenna and a recording instrument installed at NIO, which receives radio signals transmitted by the buoy at 27-28 MHz frequency band.

range of the signal is about 50 km.

The continuous wave data collected by the buoy will be of great value to the Mormugoa Port Trust, the NIO scientists and the local fishermen in connection with various port operations, navigation and for future coastal development in Goa. This is the second buoy installed by NIO in the country. The first buoy was installed in the Bombay High oilfield in May 1978 for collecting continuous data for ONGC.

The fishing vessels operating in the area have been requested to keep a safe distance from the buoy to ensure its safety and successful operation.

High Prawn Production in Paddy Fields

Studies carried out by the Cochin Regional Centre of the National Institute of Oceanography, Goa, have indicated that the traditional paddy-cum-prawn culture can be improved considerably to give better yield by the use of some simple techniques and management principles to conserve the juvenile prawn resources. A yield of up to 1000 kg/ha of large shrimp can be obtained.

The techniques are mainly concerned with the conservation and better utilization of shrimp-seed resource by proper management of paddy-cum-prawn culture.

Index for Assessment of Explosion and Fire in Mines

The Central Mining Research Station (CMRS), Dhanbad, has evolved a new index, based on carbon-hydrogen ratio of combustion products, which can be taken as a broad guideline to assess explosion and fire in coal mines.

Most of the fuels are compounds of carbon and hydrogen in different proportions. Partial and complete combustion of such hydrocarbon compounds require a definite amount of oxygen and the resultant combustion reaction forms gases like carbon dioxide, carbon monoxide, methane, ethylene,

hydrogen, oxygen, nitrogen, and water vapour, etc. in different proportions. Based on this reaction, an equation has been evolved to determine carbon-hydrogen ratio of post-explosion gases.

From gas analytical data obtained from the experimental explosions carried out in CMRS, planned explosions in experimental mines abroad as well as actual cases of explosions in underground mines of India, the carbon-hydrogen ratio has been determined in each case.

The carbon-hydrogen ratios in methane explosions have been found in general to be lower than the expected theoretical value of 3, and ranged from 2.30 to 2.80. This ratio is expected to be between 3 and 16 in all cases where coal dust explosions take place and the variation may be attributed to violence of explosion, nature of initiation, velocity of flame propagation, nature of coal and emission of carbon dioxide from stone dust, which is used as defence against explosion. In methane-initiated explosion the value may be depressed.

Carbon-hydrogen ratio can also be put into use for ascertaining the source, nature and degree of underground fire which is caused by burning of: (i) wooden prop, brattice cloth, etc., (ii) fuel of petroleum origin such as oil, and (iii) coal.

In burning of wood, jute and cotton brattice, carbon-hydrogen ratio would be very high. A ratio between 5 and 7 denotes complete combustion of diesel and other fuel oils. Incomplete combustion will show much lower figure.

In burning of coal, the intensity of the fire increases with the increase of carbon-hydrogen ratio. When this ratio is appreciably lower than that of actual coal and the rate of oxygen consumption is high, the fire is considered to be superficial and extensive. A slow rate of oxygen consumption indicates superficial and localized burning.

A fast rate of oxygen consumption and a high value of carbon-hydrogen ratio indicate blazing and extensive burning. But, fire will be considered blazing and localized if oxygen con-

sumption is found low with high carbon-hydrogen ratio.

NEW TRENDS IN PETROLOGY, MINERALOGY AND GEOCHEMISTRY

BHATNAGAR PRIZE-WINNER
DR BOSE'S WORK*

Dr Mihir K. Bose has made outstanding contributions to earth sciences, particularly in the areas of petrology, mineralogy and geochemistry.



These contributions have marked a new trend of research in these fields and have helped in a better understand-

ing of geological history of this country with special reference to magmatism.

Dr Bose's researches have been related mainly to the igneous rock suites of Sivamalai in Tamil Nadu; Koraput in Orissa; Kunavaram-Vinayakpuram, Elchuru and Kondapalli in Andhra Pradesh and Mount Girnar in Gujarat. He has investigated the petrological characters of the precambrian alkaline plutons of the Eastern Ghats belt in great detail using modern techniques. Magmatic differentiation model for the Girnar complex was established on the basis of petrological and geochemical data. Petrological data on the Deccan basalts were critically evaluated and new interpretations offered for petrogenetic evolution of Deccan basalts. The tectonic framework of Deccan volcanic province in relation to Indian plate motion was highlighted for the first time.

Bose has studied the partition of elements between coexisting critical minerals with a view to assessing their petrogenetic significance. His work on structural states and trace element chemistry of alkali feldspars from

alkaline suites and of plagioclase from anorthosite plutons of India marks a new trend of mineralogical research in this country.

Bose's research on the distribution pattern of trace elements in fractionating alkalic magmas is considered to be a work of reference. His work also embraces trace element chemistry of feldspars and ultramafic intrusions. Bose has furnished in more than 50 research papers a wealth of data and observations on petrology, mineralogy and geochemistry.

The outstanding contributions made by Dr Bose have earned him international recognition as an expert on igneous rocks. He has acted as a member in the subcommission on systematics and nomenclature on igneous rocks instituted by the International Union of Geological Sciences. He also chaired a joint session (Petrology and Mineralogy) in the Twenty-fourth International Geological Congress (1972) at Montreal, Canada.

Dr Bose received the National Minerals Award (1972) of the Union Ministry of Steel and Mines.

Dr Bose worked with the world-renowned earth scientist Prof. T.F.W. Barth of Norway, during 1966-67. He has visited a number of leading laboratories in USA, Canada and UK and has been associated with the International Geological Correlation Programme and a number of technical bodies at national level. He is the editor of *Indian Journal of Earth Sciences*.

Indigenous Development of Radiosonde Thermistors

NRDC INDEPENDENCE DAY AWARD-WINNING INVENTION*

Thermistors are thermally sensitive resistors which have a high temperature coefficient of resistance. They are of varied shapes and sizes and differ widely in compositions depending on their

*Dr Mihir K. Bose of the Department of Geology, Presidency College, Calcutta, has been chosen for the Shanti Swarup Bhatnagar Prize in earth sciences for the year 1976 (jointly with Prof. K.S. Valdiya) [CSIR NEWS, 28(1978), 113].

*Dr A.P.B. Sinha, Dr C.D. Sabane, Shri M.S. Setty and Dr S.G. Shet were jointly awarded the Independence Day (1978) Prize of the National Research Development Corporation of India, New Delhi. The prize carried a cash of Rs 6000.

applications. Radiosonde thermistors are used as sensors in the measurement of upper air temperatures with the help of balloon-borne radiosondes. Nearly 100 such balloons are sent up daily from various places in the country. These devices are extremely useful in meteorological forecasting. This class of thermistors is required to have certain special characteristics like temperature coefficient of resistance and stability.

As these thermistors were used to be imported and the Union Government desired to have indigenous supply of these highly strategic devices, the Deputy Director General of Observatories (Instruments), New Delhi, requested the National Chemical Laboratory (NCL), Pune, to take up this work on priority basis since NCL had the necessary expertise in the area of semiconductor physics and technology and also the right facilities for such a specialized development. NCL had earlier developed a process for the manufacture of thermistors used mostly in radio and other entertainment electronics.

The NCL process consists of wet grinding of oxides in a definite proportion, reacting them to form the required compound, mixing with a binder and extruding into thin rods. These rods are sintered in a furnace, electrical contacts are applied to them and their resistance is adjusted. The thermistors are then annealed and coated with an appropriate reflecting oxide.

The thermistors obey the resistance-temperature relationship, $R = R_0 \exp(-\Delta E/kT)$. The temperature coefficient of resistance (TCR) is given by $(1/R)dR/dT = -\Delta E/kT^2$.

The resistance and TCR can thus be tailor-made by controlling the factors R_0 and ΔE . These are controlled by careful formulation of composition and the preparation conditions. In these oxide semiconductors, where charge transport takes place by hopping of electrons from site to site, the activation energy ΔE is dependent on the carrier concentration. Thus by suitably op-

timizing the ratio of the different valence-state ions, one can achieve the desired control on the activation energy and thereby on the TCR. Based on these theoretical considerations, certain trial compositions were formulated and their properties studied. The optimization was carried out by systematically varying the composition, reaction and sintering temperatures, oxygen pressure during sintering, sintering time, etc. and studying the effect on the desired properties.

Another factor of great importance is the stability of the thermistor on storing, in cyclic use during field trials, etc. Adsorption of moisture in the pores of the thermistor changes the electrical characteristics by creating surface states. These states either accept or donate electrons from or to the conducting states and thereby affect the electrical characteristics. In order to obviate such a situation, it is imperative to have pore-free structure having the density close to the theoretical density. This was possible when certain sintering agents were identified and incorporated in the compositions.

In order to prevent the thermistors from getting heated up directly by solar

radiation and thus attaining a temperature different from the ambient, a suitable totally reflecting coating was worked out. This coating is also impervious to moisture and is of high resistance so that it stops any leakage conduction. The India Meteorological Department (IMD) approved the sample after conducting a series of tests.

All the raw materials and equipment required for the process are indigenously available. Based on the production of 30,000 pieces per annum, the cost of production works out to be Rs 7 per piece. As against this, the price of imported product is about Rs 15 per piece and the landed cost would be around Rs 24 per piece. Thus a substantial amount of foreign exchange is saved every year. The demand for these thermistors is expected to increase to about 40,000 to 50,000 pieces per annum for IMD in about 2-3 years.

The process has been released to Bhagyanagar Laboratories, Hyderabad, through the National Research Development Corporation of India, New Delhi, for commercial production. The firm has been meeting the demand of IMD since 1974. The imports of these thermistors have now been stopped.

CSIR SUPPORT TO RESEARCH

Structural Characteristics of 50 S and 30 S Ribosomes of *Escherichia coli*

The *Escherichia coli* ribosome, composed of three different RNA molecules (23 S, 16 S and 5 S) and 54 or 55 different proteins, is a complex organelle and is intimately involved in the various steps of protein synthesis. The *Esch. coli* ribosome with a sedimentation constant of 70 is composed of two different subunits, 50 S and 30 S ribosomes, having different structures and functions. Preliminary investigations at the Department of Biochemistry, Institute of Medical Sciences, Banaras Hindu University (BHU), Varanasi, showed that the overall structural organizations of the two ribosomes are somewhat

different. Dye binding studies, reaction with RNase I, action of trypsin and immunological approaches indicate that there is asymmetry in the organization of rRNAs and proteins in the 50 S ribosome. This is not true in the case of 30 S ribosome although 50 S ribosome is more symmetric in appearance than the 30 S ribosome (electron microscopic studies in Wittmann's and Lake's laboratories). This is also in agreement with the results obtained in Moore's laboratory by the neutron diffraction analysis of the ribosome.

It is now proposed under a new CSIR research scheme, granted to Dr D.P. Burma, Professor and Head, Department of Biochemistry, Institute of Medical Sciences, BHU, Varanasi, to

carry out the investigations in detail using the methods adopted in this laboratory and to gain more insight into the structural organization of the two ribosomes. For example, some indications have already been obtained in this laboratory that the central protuberance of the armchair model proposed by Wittmann is poor in protein and is the site of attack by RNase I. Further, it is not yet clear how the two ribosomes associate and dissociate depending on the Mg^{2+} concentration and certain other factors. Attempts will also be made to locate the sites involved in the association of the two subunits. Knowledge of the overall structural organization of the two ribosomes may also help understand the mechanism of association and dissociation.

Potato Stem-Canker and Dry Rot

In a new CSIR research scheme granted to her, Dr (Mrs) Sudha Mall of the Botany Department of Science College, Ujjain, proposes to investigate the physiology and biochemistry of *Rhizoctonia* rot of the underground parts of potato. Stem-canker is mainly responsible for pre- and post-emergent seedling collapse, while dry rot is damaging during storage and transit. Although these diseases take a heavy toll every year in both the plains and the hills, the studies carried out so far have been concerned only with the etiology and pathology of the diseases with little attention to biochemistry.

In the present investigation, pectolytic and cellulolytic enzymes secreted by different isolates of *Rhizoctonia solani* will be studied *in vitro* and *in vivo* and their role in lesion development will be estimated. Enzymological studies will be made by viscometric methods, and hydrolytic and trans-eliminative nature of cleavage will be distinguished by spectrophotometer. The nature of host response to pathogen will be analyzed biochemically at different stages of lesion development. Attempts will also be made to study the role of phenolic compounds in hindering infection and lesion development in resistant varieties.

The effect of these phenolic compounds together with certain cations on the production and the action of pectolytic and cellulolytic enzymes will be estimated with a view to understanding the nature of resistance. Similar studies will also be undertaken on certain important fungicides. It is also proposed to introduce artificial resistance with the help of cations and to select the most suitable fungicide for seed dressing and disease control.

PATENTS ACCEPTED

Indian Pat. 67/Cal/76

Differential evaporative solarimeter

T.K. BHATTACHARYYA & SURAJIT MAZUMDER

Central Mechanical Engineering Research Institute, Durgapur

Measurement of solar radiation is essential for planning and for successfully carrying out any programme for solar energy utilization. Usually, a knowledge of a few minutes' average, or even of the hourly variation of solar radiation, is adequate for the overall design, applicability and performance prediction of many solar thermal devices having thermal inertia.

The most widely used pyranometers measure nearly instantaneous solar radiation which may be recorded and integrated to obtain minute-by-minute, hourly or daily variation of sunshine. Such instruments, though accurate, are expensive, and they require many electronic components. A power supply is also needed for recording and integrating. Covered under this patent is the development of a simple, compact and inexpensive integrating type solarimeter which does not require any electronic component and power supply for its operation. It measures the integrated value of diffused plus direct solar radiation on the variously inclined surfaces for any time interval ranging from a few minutes to a few hours.

The device utilizes the difference between the rates of evaporation of a liquid, e.g. distilled water, from two identical porous papers, one of which receives solar radiation and the other is shielded. The papers are continuously

wetted by the liquid contained in two horizontal feeder glass tubes of identical diameters using suitable wicks. The shift of liquid position in each feeder tube measures the evaporation in any time interval from the associated porous paper.

When the device is exposed to sunshine, evaporation occurs from both the papers, the rate being higher for the unshielded paper because of solar radiation. The difference in the shifts of liquid positions in the two feeder tubes at any time interval corresponds to the integrated solar radiation incident during that time interval.

The instrument may be calibrated using known radiation for some time and measuring the difference of shifts of liquid positions in the two glass tubes. Such a calibration shows a linear relationship in the usual range of solar radiation intensity.

The sensitivity of the instrument with distilled water and paper size of 30×30 mm² is around 1 mm/min. for a radiation intensity of 1 cal/cm² min. in the case of 2 mm-bore feeder glass tubes. The sensitivity can be widely varied by changing the bore of glass tube, the paper size and the liquid used.

Low cost, compactness, robustness, capability of integrating and suitability for use in remote places with no power supply make this solarimeter extremely useful for solar radiation measurements necessary for solar thermal applications. Indian Pat. 748/Cal/75

Process for electrochemical preparation of β -phenylethylamine hydrochloride from benzyl cyanide

H.V.K. UDUPA, V. KRISHNAN & K. RAGHUPATHY
Central Electrochemical Research Institute, Karaikudi

β -Phenylethylamine is an arylalkylamine with a very high basicity equivalent to ammonia. This amine on condensation with dicyandiamide gives phenformine, an antidiabetic drug. It is also useful in the synthesis of a variety of antidiabetic drugs and is an efficient corrosion inhibitor. There is no indigenous production of this amine, and the annual demand is expected to be of the order of 50 tonnes. The patent

relates to a two-stage electrochemical method for the preparation of β -phenylethylamine hydrochloride from benzyl cyanide.

The first stage involves the deposition of palladium black over graphite cathode using a plating bath containing palladium chloride and ammonium chloride in aqueous hydrochloric acid medium in a divided cell. The cathodic current density and the temperature of the plating solution are very critical for obtaining an adherent thin deposit.

The second stage involves the electroreduction of benzylcyanide in an ethanolic-HCl medium using a thinly deposited palladium black cathode in a divided cell. Reduction is carried out at a low temperature, under stationary condition. At the end of the electrolysis, the catholyte is worked up to get the crude amine hydrochloride, which is purified by crystallization.

Trial runs of 50 A capacity have been carried out to prepare 125 g of amine salt per batch. Yields of as high as 70% for a current efficiency of 35.0% have been obtained. Even though current efficiencies are less satisfactory, as is normally expected of such catalytic reduction, the energy consumption is of the order of 8.65 kWh/kg of amine salt formed.

Indian Pat. 579/Cal/75

Improved mechanism for conversion of rotary motion into precision rectilinear motion

D.K. PRAMANIK & G. DORAISWAMY

Central Mechanical Engineering Research Institute, Durgapur

This patent relates to a precision linear feed movement device and aims at providing an increased working efficiency to a system wherein a precision linear feed is involved. Here, rolling friction has been incorporated to eliminate the detrimental effects of sliding in threads and consequent wear. In addition to the low friction losses and high efficiency, an important advantage of rolling friction screws and nuts is that they can be preloaded to completely eliminate backlash, which is extremely undesirable in precise motions.

In this system, circular motion imparted by any rotary machine is

converted to high precision linear motion through a rolling friction screw, ball bearing, shaft, housing cup with keyway and key.

PATENTS SEALED

2861/Cal/74 (142885): Rotary positive displacement pump, J.S. Murty & A.K. Jouhari—RRL, Bhubaneswar.

2461/Cal/74 (142895): Process for the manufacture of *o*-toluidine from *o*-nitrotoluene, P.C. Rajkhowa, B.K. Paul & J.N. Baruah—RRL, Jorhat.

511/Cal/75 (142696): A process for the preparation of pure cholesterol from buffalo & goat spinal cord, V.C. Pandey, V.K.M. Rao & C.R. Krishna Murti CDRI, Lucknow.

PERSONNEL NEWS

Appointments/Promotions

Dr U.R. Nayak

Dr U.R. Nayak of the National Chemical Laboratory (NCL), Pune, has been promoted from Scientist C to Scientist EI with effect from 1 January 1977.

Dr Nayak (born 24 July 1929) did M.Sc. (1952) from the Banaras Hindu University, Varanasi, and joined the Indian Institute of Science (IISc), Bangalore, for research in organic chemistry. He obtained his Ph.D. (1958) from the Madras University for his work on terpenoids. He was on the staff of a CSIR scheme at IISc before proceeding to Ottawa on a post-doctoral research assignment (1959-60) with the National Research Council of Canada. Joining NCL in December 1960, he started R & D work on organic natural products. Although a basic researcher by inclination and training, Dr Nayak has contributed significantly to applied research also. He was responsible for the successful completion of the PL-480 project on tung oil for which a certificate of merit was awarded by the United States Department of Agriculture. His group also uncovered the extensive chemistry of longifolene, the abundantly available sesquiterpene from Indian turpentine oil *ex* Chir pine (*Pinus longifolia*), and this paved the way for

commercial exploitation of some sophisticated perfumery products based on this important raw material. He has discovered a new source of useful steroids (possessing a high degree of anticholesterol drug activity) in guggul, the gum resin of *Commiphora mukul*. His work also led to the exploitation of undecylenic acid (a readily available product from castor oil) for the synthesis of traumatic acid—a key intermediate for the preparation of a prostaglandin synthon and for agrochemicals like insecticides and juvenile hormone analogues.

Dr Nayak has published 56 research papers and two review articles.

Shri S.R. Chaturvedi

Shri S.R. Chaturvedi, ICAS, has taken over as Deputy Chief (Finance) at the CSIR Headquarters, New Delhi [CSIR NEWS, 28(1978), 128].

Shri Chaturvedi has worked in various capacities with the Government of India and, on deputation, in autonomous bodies. He was head of the Finance & Account Wing of the India Investment Centre from 1968 to 1973. Before joining CSIR he was Deputy Controller of Accounts, Union Ministry of Information & Broadcasting.

Resignations

Shri K.A.R. Sastry, Scientist B, NCL, Pune, has resigned (25 July 1978).

Honours

Shri A.M. Lele of the National Chemical Laboratory, Pune, has been awarded Vidnyan Saraswati award for 1978 by the Hindi Sahitya Sammelan, New Delhi, for popularizing science in Marathi. Shri Lele, who has been devoted to the cause of popularization of science almost for the last three decades, is a contributing member of the editorial board of 'Srishtidnyan', a popular science magazine in Marathi.

Shri A. George Varkey, Shri A.V. Bhat and Smt. S. Krishnan Kutty, all of the Food and Spices Unit of the Central Food Technological Research Institute at the CSIR Trivandrum Complex, have been awarded the N.N. Mohan Me-

memorial Award by the All India Food Preservers' Association for their paper entitled 'Studies on the occurrences of white patches in canned pineapple', which was selected the best paper published in *Indian Food Packer* in 1977. The award was presented at the 35th annual general body meeting of the Association held in Bombay on 24 May 1978, and carried a cash prize of Rs 1000 and a certificate.

Dr Mitra Elected URSI Vice President

Dr A.P. Mitra of the National Physical Laboratory (presently Jawaharlal Fellow) has been elected as a Vice President of the International Union of Radio Science (URSI) during the Nineteenth General Assembly Meeting held in Helsinki in July-August 1978. URSI was established in 1919 and is one of the founder members of the International Council of Scientific Unions. The URSI Board of Officers consists of the President, four Vice Presidents and Secretary General. Prof. W.N. Christiansen of Australia was elected as the President of URSI. Prof. W.E. Gordon, USA, and Prof. F.L.H.M. Stumpers of Netherlands, who are Vice Presidents for last three years, were re-elected for another term of three years by acclamation. Dr Mitra and Prof. A. Smolinski of Poland were elected as the two new Vice Presidents with Dr Mitra getting an overwhelming majority of votes. This is the first time that an Indian scientist has achieved this distinction; Dr Mitra, who was a Chairman-designate for Commission G of URSI, will relinquish the chairmanship of this commission in view of his election as Vice President.

Seminar on Primary Communications in Science and Technology in India

A seminar on Primary Communications in Science and Technology in India is being organized at the Documentation Research and Training Centre, Bangalore, from 4 to 8 December 1978. Co-

sponsored by the Department of Science & Technology of the Government of India, Documentation Research & Training Centre, Bangalore, and the Publications & Information Directorate, New Delhi, the seminar will cover the following areas:

I. Publication of results of scientific research—(1) Publication channels, especially technical periodicals; coverage, timeliness, preference of scientists; and other such studies. (2) Status of Indian scientific periodicals. (3) Indian research contributions in world's major scientific periodicals. (4) Role of scientific and professional societies in science publication.

II. Quality and standards of scientific papers—(1) Criteria for quality; Refereeing system. (2) In-house assistance to authors. (3) Editorial and related matters.

III. Printing and publication facilities in India and problems—(1) Available printing and publication facilities and resources; additional new facilities and resources needed and (2) Future of scientific publication/periodicals.

Intending authors and participants may write for further information to Shri G. Bhattacharyya, Convener, PRICSTI Seminar, C/O Documentation Research & Training Centre, 31 Church Street, Bangalore 560001.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No.19/78

Applications are invited for a post of Scientist F for the Extra Mural Research Unit of the Council of Scientific and Industrial Research, New Delhi, with the following qualifications and experience.

Job Requirements: To plan and organize funding of research and development programmes of CSIR in universities, academic institutions, institutes of technology and industrial units; ability to identify areas of research relevant to the R&D activities and programmes of the CSIR laboratories, frontier areas and recent trends in research in various disciplines in science and technology.

Qualifications: High academic qualifications in a branch of science, technology or engineering.

Experience: The candidate should be conversant with the work relating to award of fellowships and schemes to scholars in universities and or research institutes. He should be a scientist with capability for research coordination activities.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merit. The person selected will be appointed on contract for a period of six years which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief(Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001. Completed *curriculum vitae* proformae must be received in this office on or before 23 November 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

CSIR Research Associateship

Advertisement/EMR/2/78

It is proposed to award 25 Research Associateships in science and engineering subjects. A person possessing minimum Ph.D. or equivalent degree or having at least 3 years' research, design and development experience after M.Tech. in engineering/technology and less than 35 years in age, at the time of application, will be eligible to apply. Persons with proven research/design development capability will be considered for the award. The selected Research Associates will get a consolidated amount in the range of Rs 1000 to Rs 1400 fixed for a period not exceeding three years. Form for application may be had from the Under Secretary, Extra Mural Research, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Request for application form must be accompanied by: (a) self-addressed stamped (70 paise) envelope of the size of 15 × 25 cm, and (b) a crossed Indian Postal Order for Rs 2 (0.50 paise for Scheduled Castes and Tribes) drawn in favour of Chief(Administration), Council of Scientific & Industrial Research, and payable at New Delhi Post Office. The envelope containing the request for form must be superscribed 'Application Form for Research Associateship'. Request for application forms must be made on or before 20 October 1978. Last date for receipt of application is 30 October 1978.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Prof. Menon Appointed Secretary, DST, and DGSIR

Prof. M.G.K. Menon, Secretary to the Government of India, Department of Electronics, and Chairman, Electronics Commission, has assumed the additional offices of Secretary to the Government of India, Department of Science and Technology (DST), and Director General, Scientific & Industrial Research (DGSIR) with effect from 9 October 1978.



Prof. M.G.K. Menon

Prof. Mam Pillikalathil Govind Kumar Menon (born 28 August 1928) obtained his B.Sc. from the Agra University and M.Sc. from the Bombay University. He obtained the Ph.D. degree at the H.H. Wills Physical Laboratory, University of Bristol, England, where he worked with Prof. C.F. Powell, NL. He was recipient, from 1953 to 1955, of the senior award of the Royal Commission for the Exhibition of 1851. He has also been awarded D.Sc. (*honoris causa*) by the Jodhpur, Delhi, Sardar Patel (Vallabh Vidyanagar) and Allahabad universities.

Joining the Tata Institute of Fundamental Research (TIFR), Bombay, in 1955 as Reader, Prof. Menon rose to the positions of Associate Professor (1958-

60), Professor and Dean of the Physics Faculty (1960-64), Senior Professor and Deputy Director (Physics) (1964-66), and finally of Director (1966-75).

Prof. Menon was appointed Scientific Adviser to the Minister for Defence; Director General, Defence Research and Development Organization; and Secretary in the Ministry of Defence for R&D (Aug. 1974-July 1978).

The principal research contributions of Prof. Menon are in the area of nuclear emulsion and balloon flight techniques; elementary particle physics, relating particularly to strange particles; and cosmic ray investigations, at the Kolar Gold Fields, at high altitudes and at great depths underground.

Prof. Menon was a member of the Cosmic Ray Commission of the International Union of Pure and Applied Physics (1963-69), and its Secretary (1969-72) and Chairman (1972-75) subsequently. Prof. Menon has held several important positions, as Director of the Physical Research Laboratory, Ahmedabad (Feb.-Nov. 1972); Chairman, Indian Space Research Organization (Jan. 1972-Jan. 1973); and Chairman of a number of companies and corporations.

Prof. Menon is the Chairman of the National Radar Council of the Government of India, of the Technology Development Council of the Electronics Commission, and of the governing council of the Indian Institute of Astrophysics (Bangalore). He is a member of the Space Commission; National Committee on Science & Technology; Radar and Communication Board; Indian National Commission for Cooperation with

Unesco; and UN Secretary General's Advisory Committee on the Application of Science & Technology to Development. He is an Honorary Professor of TIFR.

Prof. Menon was appointed Chairman of the Electronics Commission and Secretary to the Government of India, Department of Electronics, in February 1971.

Prof. Menon has been the recipient of numerous honours and awards: Fellow of the Royal Society (London) (1970); Shanti Swarup Bhatnagar Prize for Physical Sciences (1960) and the Khaitan Medal of the Royal Asiatic Society. He is a fellow of the Indian Academy of Sciences, Bangalore (its president from 1974 to 1976); Fellow of the Indian National Science Academy, New Delhi; founder fellow of the Maharashtra Academy of Sciences, Pune; honorary fellow of the National Academy of Sciences, and honorary foreign member of the American Academy of Arts and Sciences.

Dr A. Ramachandran

Dr A. Ramachandran, Secretary to the Government of India in the Department



Dr A. Ramachandran

of Science and Technology (DST), and Director General, Scientific & Industrial

Research (DGSIR), laid down his offices on 9 October 1978, consequent on his appointment as Executive Director of the newly established UN Centre for Human Settlements at Nairobi. His appointment is at the level of Under-Secretary General, which, within the UN Secretariat hierarchy, ranks just below the Secretary General.

Dr Ramachandran, who took over as the Secretary, DST, on 15 March 1973, assumed the additional charge of DGSIR on 28 July 1977 [CSIR NEWS, 27(1977), 113].

Dr Arcot Ramachandran (born 6 April 1923, Madras) graduated in engineering with honours from the University of Madras in 1943, obtained his master's degree in mechanical engineering (1947) and Ph.D. (1949) from the Purdue University (USA).

Joining the Indian Institute of Science (IISc), Bangalore, in 1950, Dr Ramachandran served as Assistant Professor of Mechanical Engineering (1950-57) and Professor and Head, Department of Mechanical Engineering (1957-67). He also headed at IISc the then newly formed Department of Industrial Management during 1965-67. Dr Ramachandran was appointed Director of the Indian Institute of Technology, Madras, in 1967.

Recipient of the Distinguished Alumnus Award (1972) of the Purdue University, Dr Ramachandran is a Fellow of the Indian National Science Academy and National Academy of Sciences.

Dr Ramachandran has been associated with various professional institutions. He is a fellow of the Institution of Mechanical Engineers (London), Institution of Engineers (India), Institution of Production Engineers (UK), and American Society of Mechanical Engineers. He is the president of Solar Energy Society of India (1977-80); and member, American Society of Engineering Education.

Dr Ramachandran has been associated, in different capacities, with the various national and international organizations/committees/conferences:

chairman, UN Preparatory Committee for United Nations Conference on Science and Technology for Development to be held in 1979; chairman, executive committee, Association for Engineering Education in South and Central Asia (1973-74); chairman, Unesco Experts Group on Engineering Education (1974); chairman, ESCAP Experts Group on Regional Centre for Transfer of Technology, Bangkok (1975); member, Scientific Council and the Executive Committee, International Centre for Heat and Mass Transfer, Yugoslavia; delegate, UNEP Governing Council Meeting, Nairobi (1976); expert, Unesco Man and Biosphere Meeting, Ottawa, Canada (1975), chairman, UNISIST National Committee; chairman, Science and Engineering Research Council; chairman, Indian National Committee for International Institute of Refrigeration; vice chairman, National Remote Sensing Agency, Hyderabad; president, Indian Society of Heat & Mass Transfer; and member, National Committee on Science and Technology.

Dr Doraiswamy Appointed Director of NCL

Dr L.K. Doraiswamy of the National Chemical Laboratory (NCL), Pune, has been appointed Director of the laboratory with effect from 30 September 1978.

Dr Doraiswamy joined NCL in 1954 as a Senior Scientific Officer after completing the doctoral work at Wisconsin (USA). He was appointed head of the Chemical Engineering and Process Development Division (formerly Organic Intermediates & Dyes Division) in 1960, which he moulded into one of the finest chemical engineering research centres in the country. He rose to the position of a Deputy Director and was subsequently elevated to the coveted position of a Distinguished Scientist.

Dr Doraiswamy's pioneering contri-

butions in chemical reaction engineering and chemical engineering thermodynamics have won him international acclaim. He has published widely in journals of international repute, has served on the editorial boards and review boards of a number of international chemical engineering journals, and has given many invited lectures in India and abroad. He also served as a Visiting Professor in the University of Wisconsin during 1977.

Dr Doraiswamy's contributions to the development of indigenous technology are outstanding. The production value of technologies based on NCL know-how has risen from Rs 0.8 million in 1966 to Rs 200 million in 1978. The group of chemical engineers led by Dr Doraiswamy has played a vital role in the transfer of technology. Dr Doraiswamy has been a consultant to Indian Petrochemicals Corporation Ltd, Baroda, and has served on the boards of directors of Engineers India Ltd; Indian Drugs and Pharmaceuticals Ltd; etc.

Dr Doraiswamy has received a number of honours for his outstanding contributions to engineering science and technology. He was recipient of the K.G. Naik Gold Medal of M.S. University of Baroda for his contributions to the development of Indian chemical industry. He is a fellow of the Indian National Science Academy and Indian Academy of Sciences.

Dr Krishna Murti Appointed Director of ITRC

Dr C.R. Krishna Murti, Acting Director, Industrial Toxicology Research Centre (ITRC), Lucknow, has been appointed Director of ITRC with effect from 25 September 1978.

Dr Krishna Murti had his early education at Trichur, Kerala. With a Madras Government Industries Department merit scholarship he pursued his graduate studies at the Andhra University, Waltair, and obtained an



honours degree in chemical technology and chemical engineering. After serving the industry in Calcutta as a graduate apprentice he joined the Department of Biochemistry at the Indian Institute of Science (IISc), Bangalore, as a Madras Government Industries Department research scholar and obtained the Associateship of IISc and doctorate in biochemistry from the Bombay University in 1948. During his postgraduate and postdoctoral training, Dr Krishna Murti was associated with research schemes sponsored by CSIR, Union Ministry of Food, and the Indian Council of Medical Research. His doctorate work related to the preparation of a vegetable rennet from fig latex and its separation from the proteolytic component. Later, he worked on the evaluation of hydrogenated vegetable oils by conducting nutritional studies in animals, human volunteers and orphanage children.

Dr Krishna Murti joined the Central Drug Research Institute (CDRI), Lucknow, at the time of its establishment in 1950. During his 25 years' stay at CDRI, Dr Krishna Murti became its Deputy Director and was responsible for creating at CDRI an active school of biochemistry oriented towards the problems of drug research, biochemical toxicology, and utilization of biological resources for development. He joined ITRC in August 1975.

At ITRC, Dr Krishna Murti has been engaged in setting up a central facility for safety evaluation of pesticides as an extension of ITRC to be the model for an ecological system for exploring the long-term health effects of pesticides and industrial chemicals and to determine standards and limits of exposure under Indian conditions.

Dr Krishna Murti's research output is covered by 200 research papers on enzymes of pathogenic bacteria, mode of action of antibiotics, mechanism of lipid peroxide formation, differentiation of pathogenic amoebae and photodecomposition of bilirubin and its role in the therapy of neonatal jaundice. He also initiated projects for the preparation

of protein hydrolysate, for the fractionation of human plasma from placental serum for preparing immunoglobulins, peptone from meat extract and a variety of biological products from slaughterhouse byproducts.

Dr Krishna Murti received advanced training in enzymology at the University College, London, and the National Institute of Medical Research, Mill Hill. He also received training in the use of isotopes for biological research at the Atomic Energy Establishment, Harwell (UK).

For his outstanding work in the encystation of pathogenic protozoa, Dr Krishna Murti was awarded the Basant Devi Anirchand Award (1973) by ICMR. He was nominated by the University Grants Commission as National Professor in Biochemistry in 1976-77.

A fellow of the Indian National Science Academy, New Delhi, and the Indian Academy of Sciences, Bangalore, Dr Krishna Murti has served the board of studies on biochemistry of a number of universities and the Indian Standards Institution and the Food Standards

Committee of the Directorate General of Health Services in their expert committees. He is presently a member of the National Committee for Environmental Protection and Conservation and Uttar Pradesh Government Council of Environment and Ecology. He has been a convener and member of the Biochemical & Biophysical Research Committee of CSIR and a member of the National Committee for Biochemistry, on behalf of ICSU. He has served on the editorial boards of *Journal of Scientific and Industrial Research*, *Indian Journal of Biochemistry & Biophysics*, *Arogya*—the Journal of Health, etc. He is the author of a book on Proteins and Human Welfare.

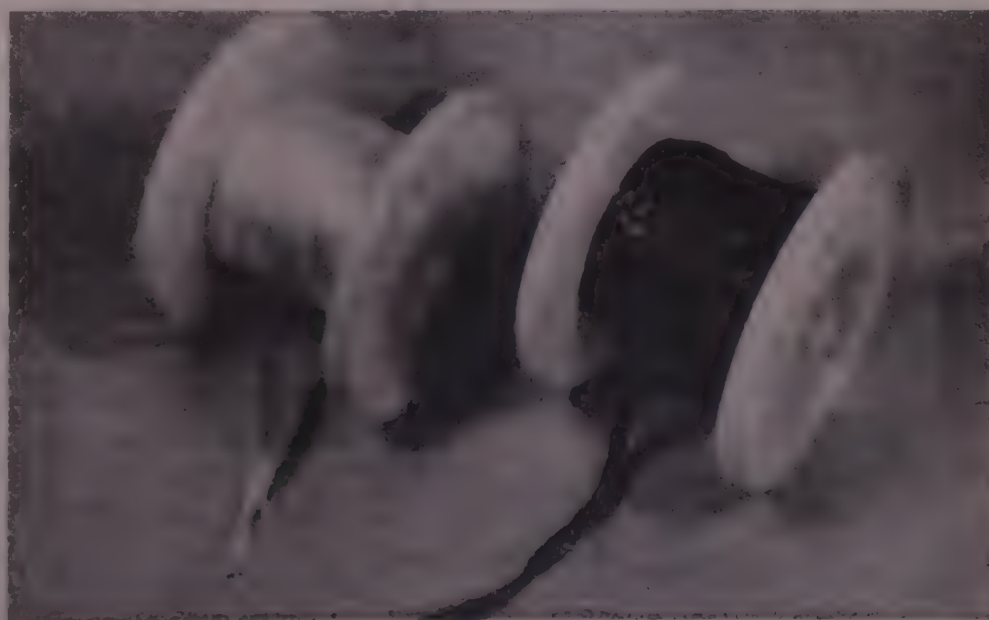
Dr Krishna Murti has represented India at the International Congress of Biochemistry at Vienna (1958), New York (1964) and Stockholm (1973) and at the International Symposium on Lysosomology at Surrey (UK) in 1973. He visited eleven countries in South-East Asia in 1964 to establish linkages with scientific organizations on behalf of the Association of Scientific Workers of India.

RESEARCH AND DEVELOPMENT ON CARBON FIBRE PRODUCTS

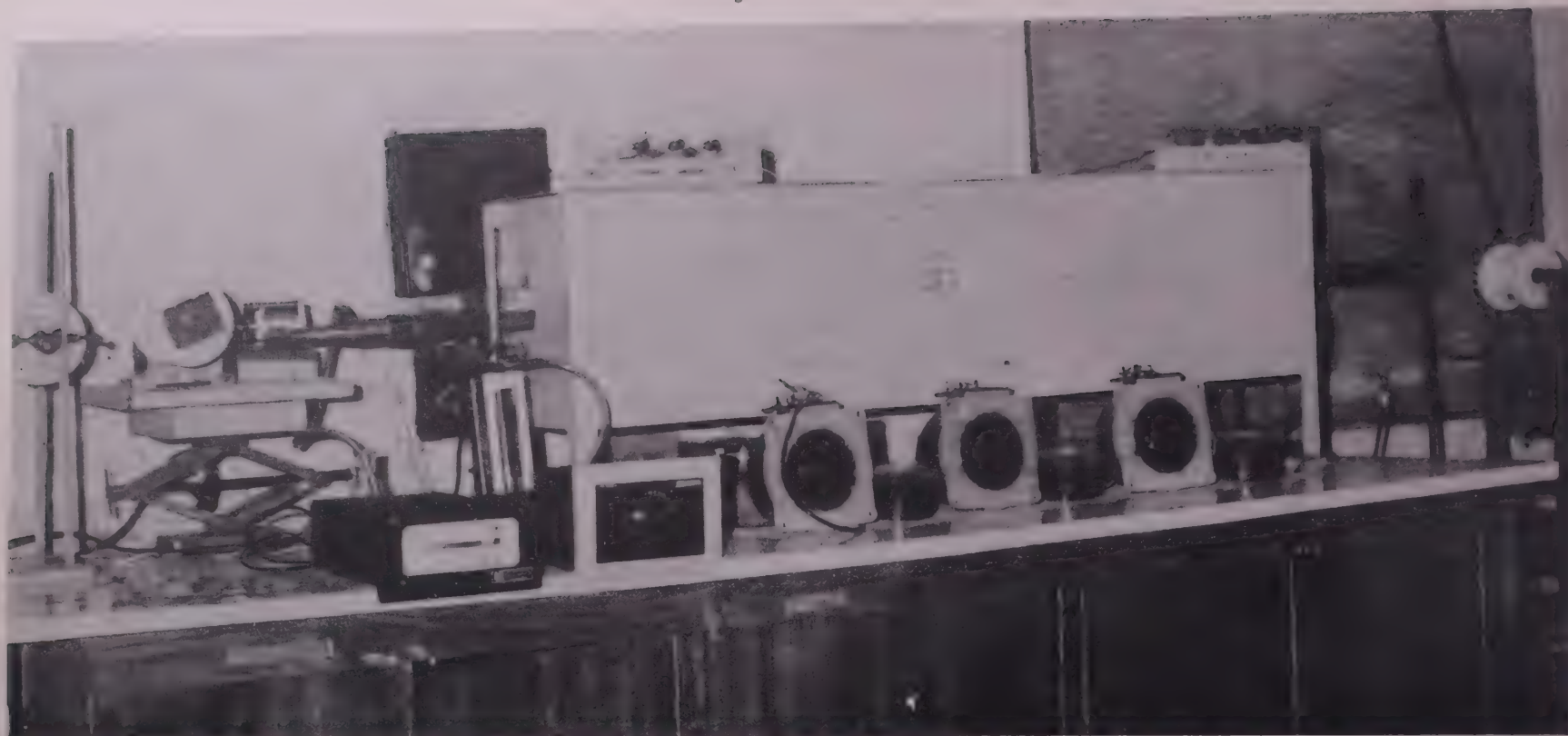
NPL's Contributions

Carbon fibres are jet black and silky materials, finer than human hair. Their importance lies in their being stronger

and stiffer than any other synthetic or natural material, except when a natural material is in the form of whiskers.



Spools containing polyacrylonitrile (white) and carbon fibres made therefrom (black)



Experimental set up designed and fabricated at NPL showing low-temperature pyrolysis of PAN fibres

Carbon fibres have been processed from viscose rayons, jute fibres, and polyacrylonitrile fibres (PAN). Lately, pitch fibres have also been successfully carbonized. The best results have been obtained with PAN fibres as precursor.

The National Physical Laboratory (NPL), New Delhi, has done pioneering work in India on the development of carbon fibres. The laboratory has worked on all the above precursors.

An account of the properties and applications of the carbon fibres is given in the following paragraphs and emphasis is laid on NPL's R&D work on the development of these fibres.

Properties: Structural materials are characterized by the three main properties, viz. strength, Young's modulus and specific gravity. Tungsten is known to have a strength of as high as 550×10^3 psi and a Young's modulus of 50×10^6 psi but its specific gravity is 19.3, and hence to achieve a certain strength and stiffness in a structure it would have to be very heavy. The specific strength, i.e. the strength/specific gravity, and the specific modulus, i.e. modulus/specific gravity, are very high for carbon fibres and are several times those of tungsten. The carbon fibre is, therefore, a stronger and stiffer light-

weight material. Hence, it finds use in structures which are intended to be strong and stiff and at the same time light-weight. However, they can hardly be used as such except as a reinforcement material. The strength and modulus in a composite are decided by volume fractions of the fibre.

Applications: Glass fibre reinforced plastics find varied uses in the developed countries. Glass fibre is cheap and has nearly the same specific strength as carbon fibre but its specific stiffness is extremely low. Carbon fibre reinforced plastics have found uses where both high specific strength and stiffness are important.

These plastics are finding increasing applications both in aerospace and civilian areas. They have been found useful for aero-engines, frames for aircrafts and spacecrafts. They are finding application in a variety of areas, the most important of which are: racing-car bodies, yachtmasts, skis, fishing rods, tennis rackets, racing boats, bearings, pressure vessels, antenna for satellites, solar energy panels, helicopter blades, and submarine bodies. They are also used in textile and chemical industries.

In India, hybrid composites of carbon

and glass fibres are likely to find uses in cheap, large-size silos for food grain and fertilizer storage, large-size fishing boats and large-diameter pipes for water transport.

Carbon-carbon composites have biomedical compatibility and are finding uses in human bodies as a light-weight high-strength material for broken joints, ligaments, etc.

Carbon fibres from various precursors: Carbon fibres processed from viscose rayon precursor, available indigenously, by carbonizing the precursor up to 1000°C yielded a low strength of 100×10^3 psi and a modulus of 6×10^6 psi. Viscose rayon possesses three-dimensional crystalline structure, but lacks in the preferred orientation of the crystallites along the fibre axis. In addition to this the material remains non-plastic during pyrolysis up to 1000°C . This inhibits inducing any orientation during carbonization. All carbon fibres including the viscose rayon-based carbon fibres become plastic at temperatures higher than 2000°C and hence in order to get high-modulus carbon fibres these fibres are to be stretched at 2000°C —a process known as stretch graphitization. By doing so one can get a Young's modulus

of $70-80 \times 10^6$ psi and a strength of $300-400 \times 10^3$ psi. The process of stretch graphitization is, however, very expensive and the fibres so produced possess low interlaminar shear strength and high scatter in the properties.

NPL has processed carbon fibres from jute for the first time anywhere in the world. Jute is indigenously available in plenty and it consists of cellulose which can be pyrolyzed to give carbon fibres of fairly good mechanical properties. It has been possible for NPL to achieve a modulus of 6×10^6 psi and a strength of $50-70 \times 10^3$ psi. Jute fibres are not available in continuous form and hence jute-based carbon fibres may find use in insulation work where short-length carbon fibres are required. They may also be used for ablative purposes.

Carbon fibres from special PAN precursors of Courtaulds, UK, have been processed at 1000°C . These fibres show a modulus of 28×10^6 psi and a strength of 250×10^3 psi. Carbon fibres processed from a Japanese special PAN 9 (Belson) precursor have also been carbonized to get a modulus of 25×10^6 psi and a strength of 300×10^3 psi. All these carbon fibres are processed from special acrylic fibres (SAF). These SAF PAN fibres are specially drawn with extra care by a few manufacturers in the world. In order to contain the technology of carbon fibre production, the special precursors are sold on a restricted basis at exorbitant prices. NPL carried out R&D work on PAN (special fibres), but, as it was not possible to procure the raw material, the project had to be dropped.

There was no other option but to work on other precursors which are available in plenty in the country. Textile-grade PAN is imported in the country by the textile industry in very large quantities. The Indian Petrochemicals Corporation Ltd, Baroda, is at the threshold of producing textile-grade PAN in quantities needed for consumption by the textile industry in India. The textile-grade PAN is available internationally at \$ 1.25/kg as compared to \$ 14/kg for the SAF

varieties. It is generally believed that textile-grade PAN is not suitable for carbon fibre processing. A systematic study of all the available textile PAN grades was undertaken and it has been possible to select a cheap variety of textile grade. This cheap textile-grade PAN is carbonized carefully under optimized oxidation and carbonization conditions. It has yielded properties which are normally obtained from costly special acrylic fibre. This has been possible only because the group at NPL has a clear understanding of the various mechanisms during processing, since these play a very important role in obtaining the required properties of the carbonized fibre.

The facilities at NPL, at present, are sufficient for producing a few kilograms of carbon fibre every year. These facilities have originated from the funds received from UNDP and the Department of Science & Technology for an inter-laboratory project on 'Newer

Fibres and Composites' in which besides NPL, five institutions, viz. the Central Glass & Ceramic Research Institute, Calcutta; the Indian Institute of Technology, Kanpur; the National Aeronautical Laboratory, Bangalore; the Central Leather Research Institute, Madras; and the Vikram Sarabhai Space Centre, Trivandrum, are participating. The project, which aims at building the competence in this field, will come to a close by the end of this year.

At present, NPL has plans for scaling up the process and for producing at least one tonne of carbon fibre based on the cheap textile-grade PAN per year in the pilot plant. Once the carbon fibre is available in large quantity for experimental product development, more and more usages of this fibre would be found in the country. The most important reason for this will be the non-availability of materials with such high specific strength and specific modulus.

SOME GEOLOGICAL ASPECTS OF THE KUMAUN HIMALAYA AND OTHER REGIONS

BHATNAGAR PRIZE-WINNER
PROF. VALDIYA'S WORK*

Prof.K.S. Valdiya's extensive studies on varied aspects of the geology of the Kumaun Himalaya, often setting out nonconformist deductions, have attracted the wide attention of critics and have necessitated rethinking on many problems of lithostratigraphy and tectonic history of the Lesser Himalaya leading to keener enquiries and investigation by other workers.

Valdiya's first-ever systematic studies of algal stromatolites in India initiated a new line of investigation and not only invested these indicators of palaeoecology and stratigraphic time with an aura of credibility, but also helped fix the positions in the stratigraphic ladder of the unfossiliferous carbonate for-

mations of the Lesser Himalaya and the Vindhyaal. What was previously



regarded as Permo-Triassic in age (270-180 m.y.) was pushed down to the Riphean Proterozoic times (1300-900 m.y.)—a deduction that has been amply

substantiated by recent radiometric dating of the associated rocks.

Comprehensive sedimentological studies carried out by Valdiya on the Precambrian Simla flysch of Himachal and Garhwal—the first ever palaeocurrent investigation in the Himalayas—demonstrated that the source of the Lesser Himalayan Precambrian sediments lay to the south in the Aravali domain, and that the palaeoslope of northern India in that period was northwards. This study indicated the

*Prof. K.S. Valdiya of the Department of Geology, Kumaun University, Naini Tal, has been selected for the Shanti Swarup Bhatnagar Prize in earth sciences for the year 1976 (jointly with Dr Mihir K. Bose) [CSIR NEWS, 28(1978), 113].

geological unity of the Peninsular India and Lesser Himalaya. Valdiya's latest palaeocurrent studies show that the pattern remained the same throughout the Palaeozoic period right up to the Upper Permian.

Valdiya's structural and lithostratigraphical investigations, backed up by palaeontological finds in the Lansdowne Hills (Garhwal), demonstrated that the uppermost lithostratigraphic unit Tal, of the Krol Nappe is of Permian age (270-220 m.y.) and not of Jurassic-Cretaceous times (150-75 m.y.) as commonly believed. Showing the Tal as the marine Gondwanic element in the Himalayan setting, he postulated that throughout the Mesozoic period the Lesser Himalaya remained a landmass.

The discovery of crucial Lower and Middle Carboniferous fossils in the Tethyan zone of the north-eastern Kumaun (made in collaboration with V.J. Gupta) has lessened the span of the Hercynian gap from what was till then regarded as embracing the whole of Carboniferous and Lower Permian to merely Upper Carboniferous-Lower Permian, thus demonstrating that the whole of the Tethys Himalaya, excepting Kashmir, had more or less the same biostratigraphic and tectonic history.

The detailed lithological and petrological study of the chain of lentiform deposits of crystalline magnesite of the Pithoragarh area led him to postulate its syndimentary replacement origin, with algae playing a very significant role in creating environment conducive for critical concentration of magnesium. Recording a unique case of intimate association of algal dolomites, crystalline magnesite and phosphorite, Valdiya made out the case for the crucial role of algae in the genesis and localization of phosphate of the Deoban Formation in Pithoragarh.

Recognizing and delineating a large number of transverse and conjugately related faults and fractures in the Himalayas, some of which extend to tens of kilometers, and coinciding locally with thrust planes bounding the nappes, Valdiya demonstrated their remarkable

parallelism with the great faults of the basement of the Ganga basin and the South Indian block, implying involvement of the Peninsular India in the tectonic framework of the Himalayas. He attributed the present-day seismicity of the Himalayan region to movement along some of the active transverse faults—a conclusion that has found striking confirmation from quantitative seismicity map prepared by Kaila and Narain of the National Geophysical Research Institute, Hyderabad.

Valdiya has written a monograph covering his eighteen years of sustained and comprehensive work in the Kumaun Himalaya, stretching from the frontiers of Nepal to the borders of Himachal and dealing with varied aspects such as lithostratigraphy, structure and tectonics, sedimentology, petrology and mineral resources. The monograph, which is in press, attempts to reconstruct a regional geological framework and brings out many crucial and significant points that necessitate

revision of the stratigraphic and tectonic history of the Lesser Himalaya. A quarter-inch geological map—first ever geological map of the whole of Kumaun Himalaya—is Valdiya's most important single contribution towards filling the gap in the geological history of the Indian subcontinent.

The lentiform deposits of magnesite, an extremely valuable refractory material in iron and steel industry, first mapped and comprehensively described from the Pithoragarh area by Valdiya are now being mined on a big scale. It was his personal effort that brought Orissa Industries and the Hindustan Steel Ltd to the field and the latter to undertake commercial mining and calcination of the raw material at the site at a rate of 100 tonnes per day. There are now three commercial concerns involved in the exploitation of the refractory rock which was first brought to the notice of the discerning geological world through the map and writings of Valdiya.

NMR SPECTROSCOPY AND MAGNETIC PROPERTIES OF METALS & ALLOYS

BHATNAGAR PRIZE-WINNER

PROF. VIJAYARAGHAVAN'S WORK*

In the early fifties, Prof. R. Vijayaraghavan constructed at the Tata Institute of Fundamental Research, Bombay, a highly sensitive NMR spectrometer with indigenous components. The first to be assembled in India, the spectrometer gave performance equal to that of the best commercial equipment available in USA. Using this, he showed that the bulk properties like susceptibility could be correlated to microscopic



*Prof. R. Vijayaraghavan, Head, Solid State Physics and Materials Science Group, Tata Institute of Fundamental Research, Bombay, has been chosen for the Shanti Swarup Bhatnagar Prize in physical sciences for the year 1976 (jointly with Prof. C.K. Majumdar) [CSIR NEWS, 28(1978), 113].

nuclear spin density in transition metals and alloys. The importance of this fundamental result can be seen from the fact that several leading laboratories in the world started similar investigations in technologically important alloys of transition metals and still continue to do so. He was the first to prove conclusively the oscillatory character of the conduction electron polarization in metals using NMR technique. This result was crucial as it settled the controversy on the nature of polarization (uniform or oscillatory) in metals. This work was hailed as very timely and was extensively quoted.

Vijayaraghavan was also the first to show the celebrated Kondo effect type behaviour in a 'concentrated' cerium alloy (unlike in a dilute alloy) and also a breakdown in the correlation between the susceptibility and the spin density.

These twin results are partly responsible for the modified theory of the localized spin fluctuations and inter-configurational interactions. In the international conference on magnetism held at Amsterdam (1976), this work was specially commended as breaking new ground in the area of magnetism. The discovery by his group of the crystal field effects on the magnetism and the hyperfine fields in the technologically important samarium alloys has been mentioned by experts as the most important contribution towards the understanding of the rare-earth alloys and towards solving several enigmas in this field. At the international conference on rare-earth alloys held in Montreal (1974), a session was entirely devoted to discussing the impact of this type of work. Several leading laboratories are experimentally testing the conclusions which would enhance the performance of the most powerful samarium-cobalt permanent magnets, and at the same time would contribute significantly to the understanding of the rare-earth magnetism.

Several new Heusler alloys have been synthesized by Vijayaraghavan's group and their hyperfine fields show extraordinarily large values which have led to the modification of the famous Fridel-Anderson theory. In the area of ferro-electrics, Vijayaraghavan was the first to use NMR to quantitatively measure the frequency of the soft mode which is normally accessible only to lasers. Independently and simultaneously, his group showed that the relaxation times of protons in water in malignant tumours are on an average longer than those in normal tissues. He is currently exploiting the powerful tool to understand some basic questions in enzyme kinetics, using a locally made pulse spectrometer. Vijayaraghavan is, so far, the only Indian scientist to have been invited to address a plenary session of the International NMR Conference. Prof. J. Itoh, twice president of the Physical Society of Japan, sponsored a special invitation to him in 1976 to be a visiting professor—the highest award

under the Japan Society for Promotion of Science. Prof. Vijayaraghavan was one of the five newly elected members of the Magnetism Commission at Munich in West Germany in 1975. He was also invited to address a Gordon type conference in Copenhagen on rare-earth alloys to a select group of invitees.

Currently, Vijayaraghavan is exploiting the various techniques available in Bombay to make better and new magnetic alloys either with samarium or with transition metals and to provide adequate theory to understand the experimental data. He is also working on an exciting new concept, viz. 'spin glass', in cobalt-gallium system. Experimental identification of such a behaviour in Co-Ga system has been praised by experts in this field.

Vijayaraghavan's group has also developed a method of producing ultrafine particles. This would result in the preparation of new materials of hitherto unknown and controlled stoichiometry. The physical and technical properties of such new materials are being investigated by him. The new materials, byproducts of molecular engineering, will be of interest in magnetism, ferroelectricity, lasers and optoelectronics.

Prof. Vijayaraghavan (born 3 January 1931) did his B.Sc.(Hons) in 1951 from the Annamalai University and Ph.D. (1962) from the Bombay University. He is a fellow of the Indian Academy of Sciences, and member of the Indian National Committee for the International Union of Pure and Applied Physics. He is also a founder-member of the Association of Magnetic Resonance Spectroscopists. He was the president of the Indian Physics Association, Bombay (1975-77).

PATENTS ACCEPTED

Indian Pat. 915/Cal/75

Improvements in or relating to colouring of nickel-chrome stainless steel

B.A. SHENOI, R. SUBRAMANIAN & R. VENKATACHALAM
Central Electrochemical Research Institute,
Karaikudi.

The process covered by the patent is

used for colouring stainless steel by immersion in a hot electrolyte based on chromic acid and sulphuric acid and the coloured surface is cathodically treated in another acidic solution for a short duration for improvement of abrasion resistance. The film formed on the stainless steel shows colours through the phenomenon of light interference. Colours produced in normal time sequence are bronze, blue, golden yellow, purple and green, and within this range a wide variety of shades can be obtained.

The appearance is dependent on the nature of the starting surface. Mat and satin surfaces produce mat colours and polished surfaces exhibit a high degree of metallic lustre. Different effects can be achieved by altering bright polished and satin finished sheets or by selective polishing prior to colouring. Masking, screen printing or photo resists techniques can be employed to achieve pattern effects and for the reproduction of the photographic images. Coloured stainless steel can be subjected to considerable deformation without detriment. It can be drawn and bent through quite sharp angles. The coloured surfaces withstand the washing action of commercial detergents and the hue does not change when heated up to 200°C.

The coloured stainless steel may be used as a practical material for a variety of applications from large architectural panels to consumer articles, such as door fittings, fountain pens and ball point pens with patterned caps and bodies, display cases and stands, panels for bath tubs, dials of watches and clocks, and signs for shops and offices.

Indian Pat. 697/Cal/75

Preparation of iron oxide black and pigments

T.P. PRASAD, V.V. RAMASASTRY, J.S. MURTY & B.R. SANT
Regional Research Laboratory, Bhubaneswar

Cleaning of metal surfaces with hydrochloric acid prior to galvanization results in the production of iron(II) chloride liquors as waste products. The usual method of disposal of such liquors, which cause environmental pollution, is to neutralize the liquor with lime, but this gives rise to another waste, the

sludge. As a part of the R&D efforts on utilization of industrial byproducts, the Regional Research Laboratory, Bhubaneswar, has developed a process to convert ferrous chlorides into useful iron oxide pigments. Iron oxide pigments are in much demand in the country and a good amount of the pigments is still imported. These pigments find applications in paints, cement, rubber, tiles, inks, linoleum, etc. The black oxide also finds application as a magnetic material in flaw detection. Synthetic pigments are preferred to natural iron oxides in many applications.

The process, covered by the patent, consists in adding milk of lime to the iron(II) chloride solution and oxidizing the resultant slurry of ferrous hydroxide at a suitable temperature in the presence of a catalyst. The product is black iron oxide (synthetic magnetite), which is filtered, washed and dried. The black oxide can itself be a salable product. To get red oxide of iron of desired shade, the black oxide is roasted at a suitable temperature. In place of ferrous chloride liquor, iron scrap and hydrochloric acid can be used as raw materials. The process has been found to be economical in a small scale and the capacity of the suggested economic unit is 200 kg per day or 60 tonnes of pigment per annum. The capital outlay required to set up such a plant has been estimated at Rs 2.35 lakh with 25% return on investment.

The process has been referred to the National Research Development Corporation of India for commercial exploitation. The know-how can be adapted to pickling plant waste streams. The laboratory has the capability to assist industries in putting up plants for the production of iron oxide pigments.

Indian Pat. 1946/Cal/75

Improvements in or relating to the electrolytic production of isonicotinic acid from gamma-picoline

H.V.K. UDUPA, M.S.V. PATHY, S. CHIDAMBARAM, (MRS) K.S. LALITHA & (MRS) J. ALAMELU
Central Electrochemical Research Institute, Karaikudi

Isonicotinic acid is an intermediate for the synthesis of isonicotinic acid

hydroxide, which is used for the treatment of tuberculosis.

In the process covered by this patent, use of expensive and explosive inorganic oxidizing agents like nitric acid is avoided by resorting to anodic oxidation of gamma-picoline in aqueous sulphuric acid. The process consists in anodically oxidizing gamma-picoline to give isonicotinic acid in an electrolytic cell fitted with a lead anode and a lead cathode. The anode chamber is separated from the cathode chamber by means of ceramic diaphragm. The process has been tried on a bench scale and the energy consumption has been found to be 15 kWh/kg of isonicotinic acid.

Exhibition of Books on Appropriate Industrial Technology

The Publications & Information Directorate (CSIR), New Delhi, in cooperation with the National Industrial Development Corporation, is organizing, during the International Forum on Appropriate Industrial Technology to be held in New Delhi from 20 to 25 November 1978, an exhibition of books and literature relevant to the theme of the conference. The forum, organized by the Department of Industrial Development in cooperation with UNIDO, will discuss papers to be presented on twelve sectors of industry: (1) Basic industries such as steel, metal transformation including capital goods, fertilizers and chemicals and the like; (2) Drugs and pharmaceuticals; (3) Textiles; (4) Sugar; (5) Cement and building materials; (6) Food storage and processing; (7) Agricultural machinery and implements, (8) Light engineering and rural workshops; (9) Oils and fats; (10) Paper products and small pulp mills; (11) Energy for rural requirements; and (12) Low-cost transport for rural areas.

All those institutions and organizations who have published books and literature of relevance to the theme of the conference may send, at the earliest, their publications for display (and sale)

at the exhibition either to Shri P.S. Shankar, Editor, or to Shri R.D. Goel, Distribution Assistant, Publications & Information Directorate, Hillside Road, New Delhi 110012. The publications will be returned after the exhibition.

S. S. BHATNAGAR PRIZES: 1977

Six scientists have been named for the Shanti Swarup Bhatnagar Prizes for the year 1977. The recipients of the awards in the various disciplines are as follows:

Biological Sciences: Dr T.C. Anand Kumar, Associate Professor, Department of Anatomy, All India Institute of Medical Sciences, New Delhi.

Mathematical Sciences: Prof. M.S. Raghunathan, Tata Institute of Fundamental Research, Bombay.

Chemical Sciences: Prof. Mihir Chowdhury, Professor of Physical Chemistry, Indian Association for the Cultivation of Science, Calcutta, and Prof. S. Ranganathan, Department of Chemistry, Indian Institute of Technology, Kanpur.

Earth Sciences: Dr K.L. Kaila, Scientist, National Geophysical Research Institute, Hyderabad, and Dr Subir Kumar Ghosh, Reader in Geology, Jadavpur University, Calcutta.

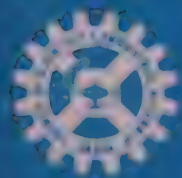
SSB prizes in the field of Physical, Medical and Engineering Sciences for the year 1977 have not been awarded.

SSB Prize Money Enhanced

The SSB Prize money has been enhanced from Rs 10,000 to Rs 20,000 for each discipline and the prize at enhanced rate would be given to the awardees from the year 1978 onwards.

NBG Renamed NBRI

The National Botanic Gardens (NBG), Lucknow, has been renamed as National Botanical Research Institute (NBRI).



CSIR NEWS

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A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Prof. B.D. Tilak

Prof. B.D. Tilak, Director, National Chemical Laboratory (NCL), Pune, retired on 30 September 1978. During his stewardship of the laboratory, NCL made significant achievements in both fundamental and applied, mission-oriented research.



Prof. Tilak has carried out outstanding basic research in the chemistry of heterocyclic compounds, chemotherapeutics and synthetic dyes. He has published nearly 200 papers.

Research carried out under Prof. Tilak's leadership at NCL has led to the establishment of several small, medium and large scale industries which are producing organic intermediates, dyes, pesticides, drugs and pharmaceuticals, petrochemicals, bulk organic chemicals, etc.

As a result of the dynamic R&D policies and programmes initiated by Prof. Tilak since 1966, the value of commercial productions based on NCL know-how increased to nearly Rs 200 million annually by 1977-78 as against Rs 15 lakh for the entire period of 1950-65. Between 1966 and 1978 the cumulative industrial production based on NCL technology amounted to Rs 815 million. Most of the production resulted in import substitution.

Prof. Tilak is the recipient of many honours and awards, the important amongst them being: K.G. Naik Gold Medal of the M.S. University of Baroda (1959), Basudev Banerjee Gold Medal of the Indian Chemical Society (1960), Shanti Swarup Bhatnagar Prize (1963),

and H.K. Sen Memorial Award of the Institution of Chemists (India) (1976). Prof. Tilak is a fellow of the Indian Academy of Sciences, Bangalore, the Indian National Science Academy, Delhi, and the Maharashtra Academy of Sciences.

Prof. Tilak has served as member on National Committee on Science and Technology (NCST); Defence R&D Council; NCST Committee on R&D in public sector undertakings; Study Group on Pesticides and Committee for Development of Dyestuff Industry, Planning and Development Council; and High Power Committee on Education & Research, Govt. of Maharashtra, etc. He has been on the boards of directors of a number of companies.

Prof. Tilak (born 26 Sep. 1918) obtained his B.Sc., B.Sc. (Tech.) and Ph.D. from the Bombay University. Proceeding to UK he obtained D. Phil. (1946) under the guidance of the late Prof. Sir Robert Robinson, NL. In 1959-60 he worked with Prof. R.B. Woodward, NL, at the University of Harvard, USA. For his researches in heterocyclic chemistry he was awarded D.Sc. by the University of Oxford, UK, in 1960. On return from Oxford in 1946 Prof. Tilak took up research and teaching at the Department of Chemical Technology of the Bombay University and served there as a Professor of Dyestuff Technology till 1965 when he joined NCL. He became Joint Director of NCL in 1965 and its Director in 1966.

Although Prof. Tilak has relinquished the office as Director of NCL, he will continue his association with the laboratory as the chief coordinator of the Centre for Application of Science and Technology for Rural Development being established at NCL.

Prof. S.H. Zaidi

To Prof. Sibte Hasan Zaidi, Director, Industrial Toxicology Research Centre (ITRC), Lucknow, who retired on superannuation on 30 April 1978, goes pre-eminently the credit for conceiving the plan of establishing a research centre devoted solely to the study of diverse problems of industrial toxicology years before the significance and relevance of the subject had begun to be appreciated.

Prof. Zaidi graduated from the King George's Medical College, Lucknow, and had his post-graduate medical education in England. He returned to India in 1955 with a Ph.D. in experimental pathology from the University of London. His association with CSIR started with his appointment as Assistant Director of the Central Drug Research Institute (CDRI), Lucknow, where he established a new division of experimental medicine. The studies initiated by him at CDRI related to the pathology of peptic ulcer and coronary heart diseases. For his outstanding work on peptic ulcer and especially for elucidating the protective role of mucins, he received the Shanti Swarup Bhatnagar Prize in medical sciences in 1963.



After a spell as Deputy Director of CDRI, he was appointed Director, Indian Institute of Experimental Medicine, Calcutta. In 1965, he took over as the founder Director of ITRC. Under his dynamic leadership, besides his own special field of pneumoconiosis, many new areas relating to toxicity of metals, pesticides, petroleum, plastics, dyes and chemicals were initiated at ITRC during

1965-1978. His research contributions in the area of silicosis, infective pneumoconiosis, asbestosis, farmer's lung, etc. are embodied in over 150 papers and reviews and the well-known treatise 'Experimental Pneumoconiosis' published by John Hopkins Press, Baltimore, USA.

In recognition of his pioneering efforts to create a centre for research in industrial toxicology the Indian Association of Occupational Health conferred on him the Sir Ardeshir Dalal Memorial Award for 1975. Dr Zaidi is a fellow of the Indian National Science Academy, the National Academy of Sciences (India) and the Indian Academy of Medical Sciences. He was a member of Expert Advisory Panel on Occupational Health of WHO. He was the first scientist from a developing country to receive the coveted Dr William P. Yant Award (1977) of the American Industrial Hygiene Association.

Dr Zaidi has represented India in a number of important conferences dealing with industrial hygiene and occupational health and put ITRC on the world map of specialized institutes in the area of industrial toxicology.

Patents System, Law & Documentation: Workshop

The CSIR Patent Unit organized a workshop on 'Patents system, law & documentation' in New Delhi on 27 and 28 September 1978. The first of a series of four, the workshop aimed at providing information and guidance to the CSIR scientists and research workers to enable them to better understand the role of the patent system. The workshop also stressed the need for documentation facilities of the patent literature in order to upgrade and increase the utility of CSIR research efforts in the industrial development of the country. Fifty-four scientists from almost all the CSIR and associated laboratories of the northern region attended the workshop.

Dr A. Ramachandran, Secretary, Department of Science & Technology,

and Director General, Scientific & Industrial Research, in his inaugural address, stressed the need for development of science and technology in India and the role of the patent system and laws in the collaboration proposals approved by Government to effect transfer of patent technology from foreign countries, wherein the payments for patents are considered a part of the overall collaboration agreement so that the patented know-how can be used even after the expiry of the agreements irrespective of the life of the patents. He stated that CSIR has filed about 2800 patents in India and about 300 patents abroad since its inception. With the expansion of its research activities CSIR has started filing about 160 patents per year around 1975 as compared to only two in the early 1950s. CSIR's contribution in respect of patents filed by Indians in India has been nearly 20%, he said.

In his welcome address, Shri R.B. Pai, Patents Officer, stressed the role of the patent system in encouraging the inventive spirit among people, particularly of rural people, farmers, small town artisans and workmen.

Three more workshops of the series will be held one each at the National Aeronautical Laboratory, Bangalore; the National Metallurgical Laboratory, Jamshedpur; and the National Chemical Laboratory, Pune.

Repair, Maintenance & Handling of Analytical Instruments: Workshop

The Central Scientific Instruments Organisation (CSIO), Chandigarh, organized a workshop on 'Repair, maintenance and handling of analytical instruments' during 3-9 October 1978. Sixty-eight scientists, engineers, doctors and technologists from premier institutions in the country attended the workshop, which covered: (i) Systems, components and analytical procedures; (ii) Spectrophotometry; (iii) Atomic absorption and emission spectrophotometry; (iv) Gas chromatography;

(v) Paper chromatography and thin layer chromatography; (vi) Electrophoresis; (vii) Polarography; and (viii) pH measurements.

A user-oriented short-term training course organized for the first time, the workshop laid stress on practical aspects of repair and maintenance of analytical instruments. Heads of divisions and CSIO service centres, who have gained considerable expertise by working for several years in servicing instruments of different specifications, design and origin, gave an account of their first-hand knowledge and experience. In addition to the CSIO staff, faculty members were drawn from the experts in industry, medical institutions, universities and chemical engineering research laboratories.

Analytical instruments were selected because of their wide usage and the sophistication involved in their operation. Besides, such instruments are referred for repair in maximum number at the various service and maintenance centres in the country.

The programme of the workshop included lectures, practical demonstrations, group discussions, case studies, audio-visual aids and exercises. The participants also had an opportunity to get their problems solved during get-together with the faculty members.

Research & Industry Get-together : CECRI

As a part of its silver jubilee celebrations the Central Electrochemical Research Institute (CECRI), Karaikudi, organized a Research & Industry Get-together from 18 to 21 September 1978. The get-together was inaugurated by Shri P. Ramachandran, Union Minister for Energy. Shri Prabbudas Patwari, Governor of Tamil Nadu, presided over the inaugural function.

In his presidential address Shri Patwari said that the Central and the State governments were fully concentrating on rural reconstruction programme with a view to raising the

economic status of the village population. For the success of this programme provision of employment with rural base was essential. He wanted the scientists to provide the inputs and know-how for the starting of small industries in rural areas.

Shri Ramachandran in his address said that the research and development activities in the field of energy have assumed considerable importance in the recent years in the context of energy crisis. He called upon the participants to carry out research to reduce electricity consumption in the electrochemical processes which would lead to the savings in the power sector.

While welcoming the delegates, Dr H.V.K. Udupa, Director of the institute, highlighted the achievements of CECRI during the last 25 years. The institute has developed 110 processes, and 74 of these have been licensed to 165 licencees. Products worth Rs 47 million have been produced. The institute's activities have benefited the pharmaceutical industry, power sources industry and food and building industries.

Technical sessions were held on electrodeposition and metal finishing, corrosion prevention, power sources, electrometallurgy and electrothermal products, electro-organic and electro-inorganic products, electrochemistry and instrumentation, and promotion of small scale and cottage industries in rural areas. A special session was held on the role of women in the integrated rural development programme.

The following organizations participated in the get-together: Indian Telephone Industries, Bangalore; Hindustan Brown Boveri Ltd, Baroda; Naval Chemical and Metallurgical Laboratory, Bombay; Toshiba Anand Batteries Ltd, Cochin; Mysore Electrochemical Works Ltd, Bangalore; National Productivity Council, New Delhi; Indian Institute of Science, Bangalore; Small Industry Extension Training Institute, Hyderabad; Tamilnadu Small Industries Association, Madras; and Patna Industrial Area Development Authority, Patna.

A silver jubilee souvenir was also released on the occasion.

Flame Stabilization by Bluff-Bodies

Flame stabilization by bluff-bodies in high-velocity combustible stream, which has been a conventional practice in jet engine afterburners and high output combustors, was investigated by Shri K.M. Kundu of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, under the guidance of Dr D. Bhaduri of CMERI, and Prof. D. Banerjee, Principal, Bengal Engineering College, Howrah, (presently Director of Technical Education, West Bengal). The aim of the investigation was to formulate a theoretical prediction procedure of the design parameters of this combustion system as well as to understand the mechanism of the phenomenon. Two-dimensional bluff-bodies of different geometrical shapes were experimentally studied for both cold flow and hot flow with stabilized flame. Theoretical data have been predicted for different flow parameters such as streamline and velocity distributions in cold flow; and streamline, velocity, temperature and concentration distributions in hot flow. These were obtained by numerically solving the elliptic differential equations for conservation incorporating *ad hoc* turbulent viscosity model and single-step combustion reaction model. Blow-off velocity was predicted from the behaviour of recirculation-zone temperature as obtained by the numerical method. A simplified theoretical model on the mechanism of flame stabilization was also developed satisfying the requirements of flame development and heat balance within the recirculation zone. This model predicts and explains important results such as recirculation zone temperature, characteristic ignition time and blow-off velocity of the present and past investigations. It is established that non-dimensional recirculation-zone temperature and non-dimensional heat exchange with

recirculation zone behave in generalized manner with non-dimensional mainstream velocity for all equivalence ratios and bluff-bodies. A theoretical relation of blow-off velocity with recirculation-zone dimension and properties of combustible stream was obtained and this holds good irrespective of bluff-body configurations. Correlations relating blow-off velocity, heat exchange and recirculation strength with one another were also seen to exist. Thus, this investigation has led to the development of a theoretical approach for predicting important design parameters for this type of flame stabilizers. This is useful to the designers and also to the better understanding of the role of recirculation zone and the mechanism of the phenomenon.

Shri Kundu has been awarded Ph.D. degree in mechanical engineering by the University of Calcutta for his thesis based on these studies.

Organic Corrosion Inhibitors

The importance of inhibitive practices in acid solutions can be realized by the fact that iron and its alloys constitute the bulk of the exposed metals in industrial and other environments. Moreover, iron is more susceptible to attack in the acidic pH range than in the alkaline range. These prompted Shri B.R. Guha of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, to study three classes of organic compounds, viz. lower monohydric aliphatic alcohols, lower polyhydric alcohols, and thiourea compounds, with a view to finding out the effects of the functional groups, stereochemical configurations of the inhibitors and non-coulombic metal-inhibitor interaction on the inhibition of mild steel corrosion in acid medium. Shri Guha also studied the application of 'phi-scale of potential' (also known as 'correlative or reduced scale of potential') and its limitations in dealing with quantitative determination of inhibition effect on acid corrosion of mild steel.

The investigations were carried out on three different lines, viz. (i) electrocapillarity and adsorption and their relation with the inhibition of mild steel corrosion in acid medium, (ii) variation of surface charge on the mercury surface because of variation of potential between metal / solution interface and its effect on adsorption of organic compounds on metal surface, and (iii) variation of surface excess with applied potential and surface charge on metal.

A correlation between adsorption of the compounds on mercury and the corrosion inhibition of steel by them in sulphuric acid solution was found with respect to seven compounds from among 19 compounds investigated.

The 'null point of a metal' appeared to be an important factor, but not the only factor in judging the region in which a substance would adsorb upon a metal and would effect inhibition. Other factors like surface structure effect, double layer effect and coordination compound formation sometimes appear to play a secondary role. It should, therefore, be emphasized that the parallel increase of adsorption on mercury and inhibition of iron corrosion does not always support the 'phipotentia concept' or a mechanism in which inhibition is related to the attachment of inhibitor molecules to 'active centre' on the surface.

The results point to the conclusion that adsorption and corrosion inhibition increase with increase in the N-alkyl chain length of a homologous series of organic substances. Monohydric alcohols were, in general, better inhibitors in acid corrosion of steel than the polyhydric alcohols with the same number of carbon atoms in the hydrocarbon chain. High molecular weight was not always necessary for good inhibition if a strongly adsorbing group was present in the molecule. Adsorption and corrosion inhibition would be displayed by a rather insoluble substance having a sulphur atom, an aromatic ring and a methyl group, since such a compound can have : (i) the

advantage of electron density and polarizability of the sulphur atom, (ii) the π -electron interaction of the aromatic ring favouring a more horizontal orientation on the metal surface, and (iii) the electron repelling +I effect of the nucleophilic alkyl group which would increase the electron charge on the sulphur atom by an inductive effect.

Shri Guha has been awarded D. Phil. degree of the Burdwan University for his thesis based on these studies. The studies were carried out under the guidance of Dr S.N. Banerjee, Assistant Professor, Regional Engineering College, Durgapur.

Conference Briefs

Shri T.N. Rajan of the Indian National Scientific Documentation Centre (Insdoc), New Delhi, participated in the thirty-ninth Congress of the International Federation of Documentation (FID) held at Edinburgh during 22-28 September 1978. He represented India in the FID general assembly meeting. He also attended the FID pre-congress seminar organized during 18-22 September by the FID committees on Education and Training and Information for Industry in collaboration with the Association of Special Libraries and Information Bureaux (ASLIB), UK, under the cosponsorship of Unesco and the German Foundation for International Development. Thirty-two invited and 31 contributed papers were presented in the congress.

The theme of the congress, 'New trends in documentation and information', was discussed in the following sessions: Development in the theoretical basis of information—documentation including linguistics; New trends in technology and their applications in information handling; Processing technology; New trends in classification and other systems for information retrieval; and New trends in organization and management of information.

Shri Rajan presented a paper titled 'Education and training in documentation and information science in India. Recent developments' at the FID pre-

congress seminar on education and training. In his paper, Shri Rajan highlighted the recent efforts made in India by Insdoc, the Documentation Research and Training Centre (Bangalore), and the universities to meet the increasing demand for trained personnel to plan, design and operate the newly springing up institutions under the national information system of the country.

Shri Rajan also attended the 52nd annual meeting of ASLIB held at Edinburgh from 20 to 22 September.

* * *

Dr P.K. Seth of the Industrial Toxicology Research Centre, Lucknow, participated on invitation from the International Brain Research Organization in the International Symposium on Neurobiology held at the University of Tehran from 8 to 11 May 1978.

About 150 participants, including 74 investigators who delivered invited lectures or presented posters, attended the symposium. Invited lectures and posters were grouped in the following areas: (i) Cell and synapses in neuronal development, (ii) Receptors and synapses in neural development, (iii) Model systems for neural development, (iv) Factors affecting sensory and motor development, (v) Specificity and plasticity in neural development, (vi) Neural regeneration in developing and adult mammals, and (vii) Human neural development. A special symposium presentation 'History of neuronal connectivity' by Prof. Hendrick Vander Loos was also arranged.

A number of papers described the use of neuronal cell culture and modern biochemical techniques in the studies on developing brain. Considerable interest was evinced in brain taurine, an amino acid whose physiological role is not understood presently. In man and all animals studied, brain taurine concentration was found to be greater in the fetus and new born than in the mature animals. It was suggested that deficiency of this amino acid during development may cause blindness. The human milk is an important source of taurine and this

may perhaps be the reason that many cases of blindness are not seen in infants living on mother's milk. The concentration of taurine in plasma and urine of infants growing on formula-food devoid of taurine was found to be low.

Observations based on biochemical and electrophysiological parameters suggested that undernourishment delays the functional maturation of brain in mammals. Evidence was presented that retardation of brain maturation, judged by certain biochemical indices, can be restored by rehabilitating the animals to normal diet. However, how far the brain will be functionally active is to be investigated.

Dr Seth, in his presentation, reported that developing animals are also susceptible to acrylamide, a widely used chemical in plastic industry. The changes in the levels of serotonin, dopamine and nor-adrenaline in the brains of developing experimental rats suggested that the neurotoxic effects of this chemical are mediated through the alterations in the synaptic transmission function.

Dr Seth was elected as the charter-member of the International Society of Developmental Neurobiology formed at the symposium.

Deputation Briefs

Shri S.Y.S. Singbal of the National Institute of Oceanography, Goa, attended a 6-month diploma course in marine pollution chemistry in the Department of Oceanography, University of Liverpool, UK, held from 16 January to 15 June 1978.

During his stay in UK, Shri Singbal also visited a number of marine sciences laboratories and acquainted himself with the recent techniques in detection and monitoring of marine pollution.

Annotated Bibliography on Carbon Technology

The Indian National Scientific Documentation Centre (Insdoc), New Delhi, has brought out an annotated bibliography on carbon technology. The first

one to be brought out as a prelude to Insdoc's programme to publish state-of-the-art reports on subjects of national importance, the bibliography (compiled by Shri H.N. Rangachar), lists 246 references covering the last 10-15 years. The entries have been grouped under broad sub-divisions, such as Pore size, surface area, permeability, particle size and adsorption; Strength and modulus; Electronic properties; Carbon rheology; Oxidation studies; Pyrolytic graphite; Carbon fibres; and Carbon brushes. An author index and a keyword index are also included. Copies of the bibliography (Price Rs 10, \$ 3) can be had from: The Scientist in charge, Insdoc, Hillside Road, New Delhi 110012.

Approaches and Methodologies for Development of Groundwater Resources

PROCEEDINGS OF
INDO-GERMAN WORKSHOP
The National Geophysical Research Institute (NGRI), Hyderabad, has brought out the proceedings of the Indo-German workshop on 'Approaches and methodologies for development of groundwater resources' organized from 26 to 30 May 1975 at Hyderabad.

The workshop was sponsored by Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, West Germany; NGRI; Central Groundwater Board, New Delhi; and Andhra Pradesh State Groundwater Department, Hyderabad.

The publication includes 34 papers presented by more than 80 scientists from India and FRG and these contributions have been grouped under the seven technical sessions, viz. Demand and utilization of groundwater resources; Hydrogeological studies; Geophysical exploration, hydrogeological and geophysical studies in Lower Maner Basin; Simulation studies; Water in the unsaturated zones; Isotope hydrology; and Management of groundwater resources.

The proceedings are profusely illustrated. Scientific discussions that followed each paper are, as far as possible, reproduced. Salient features of the recommendations of the workshop are also appended.

The publication [Pp. 406 + vii, crown 4to, hard-bound, Rs 112 (\$ 14)] is available on sale from the Documentation Officer, National Geophysical Research Institute, Hyderabad 500007.

MAGNETOHYDRODYNAMICS AND PLASMA ASTROPHYSICS

BHATNAGAR PRIZE-WINNER PROF. TREHAN'S WORK*

Prof. S.K. Trehan investigated, in 1958, the stability of force-free magnetic fields for the first time and gave the criteria under which these configurations were stable. This work is of fundamental importance in astrophysics. He also examined the effect of fluid motions on the stability of helical magnetic fields under very general conditions and proved that these fields were stable when the energy in the fluid motions was at least equal to that in the magnetic field.



The instability of contra-streaming plasmas was investigated by Prof.

Trehan taking into account the Coulomb collisions via the Fokker-Planck coefficients in the Boltzmann equation. It was demonstrated that the contribution of the electron-electron collisions between one stream and the other was an order of magnitude smaller than that of the electron-ion collisions. Further, in electron-electron collisions, the diffusion terms tend to be of the same order as that of the frictional terms. While the temperature had the effect of

*Prof. S.K. Trehan, Professor of Applied Mathematics, Panjab University, Chandigarh, has been chosen for the Shanti Swarup Bhatnagar Prize in mathematical sciences for the year 1976 (jointly with Prof. K.R. Parthasarathy) [CSIR NEWS, 28(1978), 113].

increasing the maximum wave number below which the plasma was unstable, the collisions had no effect on this wave number. The growth rate of maximum instability decreases (compared to its value for a cold plasma) on taking into account the thermal motions, but increases when collisions are taken into account.

One of the remarkable contributions of Prof. Trehan is a consistent mathematical theory of magnetically distorted gaseous polytropes. The equilibrium structure and oscillations of a gaseous polytrope with toroidal and poloidal magnetic fields were examined by him under the assumption that the magnetic energy was small compared with the gravitational energy of the configuration. Magnetic field tended to be more centrally condensed with increasing value of the polytropic index. An important conclusion was that the

ratio of the magnetic energy of the toroidal component to that in the poloidal component varied approximately as the cube of the polytropic index for the lowest characteristic mode of the magnetic field.

Prof. Trehan also examined the effect of magnetic fields on rotating gaseous masses. It was found, generally, that a toroidal magnetic field had no effect on the point of bifurcation, i.e. the point where the Jacobi ellipsoids branched off from Maclaurin spheroids. However, the presence of a component of the magnetic field along the axis of rotation shifted the point of bifurcation to higher values of the eccentricity compared to the one which prevailed in its absence.

Prof. Trehan has published two review articles on plasma oscillations and more than 40 research papers on magnetohydrodynamics and plasma astrophysics.

CSIR SUPPORT TO RESEARCH

Non-Toxicity of Retinoic Acid to Rat Fetus

The absolute requirement of vitamin A for embryonic development has been demonstrated in several animal species. Vitamin A deficiency in experimental animals generally caused abortion, and if carried to term, the litters were underdeveloped. Male and female rats raised on a vitamin A-deficient diet supplemented with retinoic acid lost their ability to reproduce, and biochemical changes indicative of a reduced rate of cell division were observed in the fetuses and placenta by the 14th day of gestation. Mild vitamin A deficiency in females often led to deformities in the offspring. But the vitamin A-deficient male chicks were fertile and the egg-laying performance of females was nearly normal. However, when such eggs were fertilized, the embryos failed to develop after the second day and injection of a physiological dose of retinol or retinyl esters into the eggs restored normal growth of the embryo. On the other hand, injection of retinoic

acid to eggs even at low concentrations (1-5 $\mu\text{g}/\text{egg}$) resulted in death of the embryos after 5 days, irrespective of whether the eggs were from hens fed with normal diet or from vitamin A-deficient hens maintained on retinoic acid. Retinol also exhibited a similar effect, but only when administered at a higher dose ($> 500 \mu\text{g}/\text{egg}$).

In the light of the above observations on the toxic effect of retinoic acid on the development of chicken embryo, the effect of retinoic acid on mammalian embryo was studied at the Indian Institute of Science (IISc), Bangalore, with a view to examining the possibility of using retinoic acid for termination of pregnancy in higher animals. In the project studied by Dr K. Sreekrishna, a CSIR senior research fellow, and Shri B.R. Srinath under the supervision of Prof. H.R. Cama of the Department of Biochemistry, IISc., pregnant rats of the strain maintained on normal diet were employed for the retinoic acid injection experiments. The day on which the sperms were found in the vaginal smear of rats was considered as the day 1 of

pregnancy. A laparotomy was performed on these rats on the day 6 of pregnancy to confirm implantation and the number of sites counted. Retinoic acid solution in ethanol or a dispersion of retinoic acid in phosphate buffered saline with pH 7.6 (0.1 M sodium phosphate buffer, 0.14 M NaCl) was used for the administration of the material. Retinoic acid did not exhibit any effect on the development of the rat fetus and both the experimental and control pregnant rats delivered normal pups. Thus, it appears that retinoic acid is not toxic to rat fetus after the day 6. It needs to be examined whether retinoic acid has any toxic effect on rat embryo earlier to the day 6.

Diseases of Tree Spices in Kerala

The demand for the products of spice crops like nutmeg (*Myristica fragrans* Hout), clove (*Eugenia caryophyllata* Thumb.) and cinnamon (*Cinnamomum zeylanicum* Breyn) in the country is on the increase day by day and the internal production of many of these items is far from sufficient. In recent years, cultivation of these tree spices is on the increase in Kerala. The main factors which reduce the yield of these crops are the diseases attacking them. No systematic efforts have been made so far to study the diseases affecting the tree spices in this country and to evolve proper control measures against them.

Under a new CSIR research scheme granted to Dr M.C. Nair of the Department of Plant Pathology, College of Agriculture, Vellayani, Kerala, it is proposed to take up a detailed study of the diseases of the above crops as they occur in Kerala and to evolve proper control measures. It is proposed to conduct a detailed survey throughout the state for the prevalence of various diseases during the different periods of the year and to record the losses due to these diseases. The causal organism of the various diseases will be isolated and its pathogenicity established and the physiology of parasitism studied in detail. The epidemiology of the various diseases will be studied in detail and the

comparative efficacy of various fungicides in controlling the diseases will be assessed.

PATENTS ACCEPTED

Indian Pat. 1269/Cal/75

A process for improving the tool life of high-speed steel tools

S. JANA, A. BASU & B.K. GHOSH
Central Mechanical Engineering Research
Institute, Durgapur
AND

S.C. DASGUPTA
Regional Engineering College, Durgapur

Commercially heat-treated high-speed steel cutting tools with average grain size (intercept 12 or 12 μm grain diam.) wear fast during cutting. Tool edges need frequent regrinding and resharpening which result in higher tool consumption.

The patent covers the development of a special heat treatment process which will produce ultra-fine grained high-speed steel tools. Such tools will show better wear resistance and roughness and hence improved tool life.

The specially developed heat treatments called 'temper-annealing' and 'transformation annealing' are to be first applied on hot-worked and mill-annealed high-speed steel tool bits. The tools thus heat-treated are to be subjected to the conventional hardening and tempering processes. Tools with extra-fine austenite grains in the range of intercept 18 to 28 (8 μm to 5 μm grain diam.) can be produced this way. In terms of cutting performance, this will mean a 2 to 3 times increase in actual tool life. The slightly extra cost of heat treatment will be more than compensated by the improved wear resistance and toughness of such tools and avoidance of frequent regrinding and resharpening of tool edges resulting in enhanced tool life.

Indian Pat. 1166/Cal/75

Soak cleaning compound for steel contaminated with oil

K.S. RAJAGOPALAN, C. RAJAGOPAL, N. KRITHIVASAN, R. SRINIVASAN, M.E.K. JANAKI, M. SETHUKUMARI & P.S. MOHAN
Central Electrochemical Research Institute,
Karaikudi

Mineral oils, vegetable oils and greases are usually applied to ferrous surfaces for corrosion protection during transit and storage. It is essential to remove these oils and greases before painting. Several proprietary compositions are used for this purpose.

This patent covers the process relating to the development of a degreasing solution based on alkaline inorganic compounds and wetting agents. The solution removes all types of mineral oils, vegetable oils and greases. The process consists in mixing the different constituents with water under stirred conditions to get a concentrated degreasing solution. The solution is further diluted 10-20 times depending upon the use.

The process controls have been studied on a pilot-plant scale. All the ingredients used in the composition are available indigenously. Some important items required for large-scale preparation of the composition are mild steel mixer, Avery balance and storage tanks.

The suggested economic unit for the industry is one with a capacity of 1000 litres of degreasing solution per day. The total capital outlay to put up such a unit is estimated at Rs 1.64 lakh. The cost of production of the degreasing solution (liquid concentrate) works out at Rs 1.45/litre.

PATENTS FILED

472/Del/78: Process for the extraction of the total-alkaloids from the roots of *Catharanthus roseus* G. don (*Vinca rosea* Linn.), S. Ramesh, C. Devakumar & Gopal R. Mallavarapu—CIMAP, Lucknow.

473/Del/78: Improved process for the preparation of β -ionone, C. Devakumar, S. Ramesh & Gopal R. Mallavarapu—CIMAP, Lucknow.

474/Del/78: A powder sprayer, D.C. Parashar, N. Kumar, V.K. Bahl & J.R. Anand—NPL, New Delhi.

485/Del/78: *Plantago ovata* seed husk, S. Singh, R.C. Nandi, J.P.S. Sarin & N.M. Khanna—CDRI, Lucknow.

520/Del/78: A process for making an efficient photoconducting material com-

prising organic pigments and polymers to be used in electrophotography, P.C. Mahendru, S. Radhakrishnan, N.L. Pathak & M.N. Kamalasanan—NPL, New Delhi.

528/Del/78: Improvements in or relating to the electrolytic graining of aluminium plates for lithographic printing, B.A. Shenoi & R. Venkatachalam—CECRI, Karaikudi.

530/Del/78: Improvements in or relating to the preparation of oil-well cement additive, T.C. Saikia & S.N. Dutta—RRL, Jorhat.

535/Del/78: Improvements in or relating to the process for the manufacture of membrane filter for microfiltration of bacteria which exceeds in dimension the filter pore size; product designated as 'Microfilter-P', M.V. Nanoti & P.M. Patni—NEERI, Nagpur.

541/Del/78: A process for the preparation of electrolytic manganese dioxide from ferromanganese slag, V.M. Pandey, S.C. Das, P.K. Sahoo, P.K. Rao & P.K. Jena—RRL, Bhubaneswar.

542/Del/78: Preparation of manganese sulphate monohydrate from ferromanganese slag, S.C. Das, P.K. Sahoo & P.K. Rao—RRL, Bhubaneswar.

548/Del/78: A new neutral bath for obtaining bright zinc deposits, B.A. Shenoi & M. Pushpavanam—CECRI, Karaikudi.

558/Del/78: A process for the preparation of new, yellow to scarlet azo cationic dyes using *p*-aminophenacyltrimethylammonium chloride as the diazo component for application to polyacrylonitrile fibres, N.R. Ayyangar & I.K. Khanna—NCL, Pune.

640/Del/78: A process for the synthesis of phenolic tetraphenylethylenes, K. Venkata Babaji Rao & R.N. Iyer—CDRI, Lucknow.

656/Del/78: A process for the synthesis of substituted 3,5-dihalosalicylanilides, S.K. Dubey, A.B. Sen, H. Singh, S. Sharma, R.N. Iyer, (Miss) S. Gupta, S. Ram & J.C. Katiyar—CDRI, Lucknow.

PERSONNEL NEWS

Appointments/Promotions

Dr V. Damodaran

Dr V. Damodaran of the National Chemical Laboratory (NCL), Pune, has been appointed, on promotion, Scientist EI at NCL with effect from 28 September 1977.

Dr Damodaran (born 21 Oct. 1925) obtained his M.A. (1947) and Ph.D. (1960) degrees from the University of Madras. Before joining NCL in 1951 he worked with Fertilizers and Chemicals Travancore Ltd (FACT). His early work at NCL related to the extraction and reduction of titanium dioxide from its ores. As a post-doctoral research fellow (1960-62) at the University of Birmingham (with Prof. J.C. Tatlow) he worked on organofluorine compounds. As a project leader at NCL Dr Damodaran has been responsible for developing several processes such as the soda ash recycle process for the production of synthetic cryolite, the process for the chlorination of bauxite residues and the sulphate recycle processes for the production of N-P fertilizers. At present, he is also guiding the work of the Analytical Group of the Inorganic Division. He also served for a year (1968-69) on deputation as Research Officer at FACT. Dr Damodaran was a convener-member of the Inorganic Chemicals group of the Chemical Industry Panel of the National Committee on Science and Technology (1972-73) and is an associate member of the Institute of Chemical Engineers (India). He has a number of research papers to his credit.

Shri P.K. Ramanujam

Shri P.K. Ramanujam, Joint Secretary (Finance), Department of Science and Technology, is looking after the work of the Chief (Finance), CSIR, in addition to his existing duties.

The following have been appointed Scientist B, on promotion, at the National Geophysical Research Institute, Hyderabad: Shri P.K. Agrawal

(4 Sep. 1978); and Shri O.P. Pandey (on deputation, yet to join).

Appointed as Scientist B at the National Environmental Engineering Research Institute, Nagpur are: Smt. P. Nawghare (25 Sep. 1978); Shri N. Shivarman (25 Sep. 1978); Shri V.S.S. Bhashkara Murthy (25 Sep. 1978); and Dr C.U. Prasad (20 Sep. 1978).

Consequent on assessment, Shri P. Durgaprasadarao, Translating Officer, Indian National Scientific Documen-

tation Centre, New Delhi, has been promoted as Senior Translating and Abstracting Officer (20 June 1975).

Headquarters of SERC Shifted from Roorkee to Madras

The headquarters of the Structural Engineering Research Centre (SERC) has been shifted from Roorkee to Madras. The centre at Roorkee will continue to function as a regional centre of SERC.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 24/78

Applications are invited for a post of Scientist F in the scale of Rs 2000-125/2-2500 to look after Science Reporter and Public Relations Units of the Council of Scientific & Industrial Research Secretariat, New Delhi.

Qualifications: High academic qualification in science, technology or engineering.

Experience: Candidate should have considerable experience in the field of popular science journalism, editing and production of popular science magazine, writing features/reports on science and technology. Candidate should also have considerable experience in dissemination of scientific information through mass-media and in organising exhibitions inside and outside India.

Job Requirements: To edit and produce CSIR's popular science monthly 'Science Reporter'; to write popular articles and features on science and technology; to disseminate achievements of the national laboratories under CSIR through newspapers, magazines, radio, films, exhibitions, etc; to organize press conferences and symposia, and exhibitions on national and international level.

Age: Below 50 years, relaxable in case of deserving candidate.

Scientists/technologists interested may obtain two copies of the standard proforma, for sending their *curriculum vitae*, from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001. Completed *curriculum vitae* proformae must be received in this office on or before 14 December 1978.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

Advertisement No. 25/78

It is proposed to appoint one Scientist F (Deputy Director) for the National Aeronautical Laboratory, Bangalore.

Job Requirements: The candidate is expected to Head the Fatigue & Fracture group of the National Aeronautical Laboratory and take complete responsibility for all R&D activities in this area including life evaluation programmes of aircrafts.

Qualifications & Experience: Ph.D. or M.E. in aeronautical engineering with 6 years' R&D experience in the case of Ph.D. or more than 10 years' experience in R&D in the case of M.E. relating to fatigue and fracture problems relevant to aeronautics. Should have good in-depth knowledge in various aspects of fatigue life evaluation of aircrafts; fatigue analysis and design of structures; fracture mechanics and its application in design of aircraft structures. Should be familiar with the current developments in the field of fatigue and fracture mechanics.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the post. The person selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service.

Age Limit: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001 before 25 November 1978. They can also obtain a brochure on the aims and objects and latest annual report of the laboratory. Completed *curriculum vitae* proformae will be received in this office on or before 28 December 1978.

Canvassing in any form and/or bringing in any influence political or otherwise, will be treated as a disqualification for the post.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

Utilization of Red Mud—A Waste of Aluminium Industry: Seminar

An all-India seminar on 'Utilization of red mud—A waste of aluminium industry' was organized at the Regional Research Laboratory, Bhubaneswar, on 22 November 1978. The purpose of the seminar was to chart out a plan for coordinated and time-bound R&D programme in this area of national importance. Prof. P.K. Jena, Director of the laboratory, who is also a member of the State Planning Board, Orissa, conducted the deliberations of the seminar as chairman. Apart from the scientists of the laboratory, scientists and technologists from the Banaras Hindu University, Varanasi; the National Metallurgical Laboratory, Jamshedpur; and the Bhabha Atomic Research Centre, Bombay, participated in the seminar. The seminar was also attended by representatives from the following aluminium producing industries: Bharat Aluminium Co. Ltd, Korba; Hindustan Aluminium Co. Ltd (Hindalco), Renukoot; Indian Aluminium Co. Ltd, Muri; and Directorate General of Technical Development (DGTD), New Delhi.

Prof. Jena emphasized the need for keeping the hazards of pollution in view in solving the problem of disposal of this aluminium-industry waste.

The seminar recommended that: (1) Titania should be recovered from red mud and should be used as a raw material in cement industry; (2) Bricks should be produced using red mud with proper additives; (3) A blended mixture of red mud and fly ash should be used in

making roads; and (4) Studies should be carried out to produce sponge iron from the alumina and titania recovered from red mud of Pottangi area.

A working group has been formed to carry out studies at Hindalco's work for utilization of red mud in cement industry. A review committee, with Prof. Jena as chairman, has been formed to review the progress made by the working group.

Dr Bhakuni Elected FNA

Dr D.S. Bhakuni of the Central Drug Research Institute (CDRI), Lucknow, has been elected fellow of the Indian National Science Academy, New Delhi.

Dr Bhakuni's work relates to the systematic examination of a large number of indigenous medicinal plants for biological activity. He has isolated several biologically active compounds from these plants.

The structure, stereochemistry and absolute configuration of these compounds have been determined. These studies have uncovered biological activity in a number of new natural products. Some of these structures have given new leads for synthesizing potent drugs. He has achieved biogenetic type of syntheses of some morphine, proaporphine and aporphine alkaloids. He has made notable contributions to chemotaxonomy of *Nothofagus* species of Chilean origin. He has also examined a number of marine plants and animals for biodynamic substances.

A pioneer in the country in alkaloid

biosynthesis, Dr Bhakuni has made outstanding contributions in this area. With the help of tracer technique he has uncovered the biosynthetic pathways of a number of biologically active proaporphine, dihydroproaporphine, aporphine, 1-benzyltetrahydroisoquinoline, morphinandienone, *Tylophora* and abnormal *Erythrina* alkaloids. Using radio and optically active precursors he has studied the stereospecificity of enzymatic reactions and have determined the absolute configuration of *Tiliacora* alkaloids.

Dr Bhakuni is a member of the Chemical Society, London; Chemical Society, Chile; and Indian Chemical Society, and a fellow and member of the National Academy of Sciences, Allahabad.

Dr Bhakuni is a recipient of the Shanti Swarup Bhatnagar Prize for chemical sciences for the year 1975.

Dr Bhakuni has to his credit more than 100 research papers and a number of reviews.

Prof. Y. Nayudamma

Prof. Y. Nayudamma, Distinguished Scientist, Central Leather Research Institute (CLRI), Madras, has been appointed by the Union Ministry of Education as chairman of the committee to evaluate the foreign assistance so far received by the Indian Institutes of Technology, capabilities developed by them and gaps that are yet to be filled through foreign technical assistance. Prof. Nayudamma will take the place of Dr A. Ramachandran, who has gone on foreign assignment. Prof. Nayudamma has also been appointed as chairman of the review committee to review the entire programme of postgraduate



education in engineering and technology. He has also been appointed an expert member/adviser on the selection

committee for the appointment of the directors of Indian Institutes of Technology.

MULTI-CHANNEL DATA-LOGGING SYSTEMS

NAL's CONTRIBUTION TOWARDS ACQUISITION AND CONTROL OF PHYSICAL AND MECHANICAL PARAMETERS IN INDUSTRIAL PROCESSES

Background

The advent of modern technology in various areas of research and development and the consequential increase in rate of industrial production have brought forth the necessity to acquire and measure data from many sources within a short interval of time. The basic parameters for which measurement is often sought are the various physical and mechanical phenomena such as pressure, temperature, flow, displacement, load, vibration and acceleration and a host of many such process variables. These parameters are generally measured by converting them to electrical signals by employing suitable transducers, the electrical output of these being not more than a few millivolts at full scale. The millivoltmeters used are subject to 'read-off' errors due to human intervention. Moreover, where large complex para-

meters are to be recorded within a short interval of time and to a high degree of accuracy, automatic measuring and logging of data become inevitable.

Automatic data logging system is the practical solution for such specialized needs and plays a vital role in a variety of industrial applications for control and monitoring of various critical parameters in the course of a process. Its capacity for information processing at very high speeds and its ability to work as an integral part of a control system make it suitable for use in automatic control of industrial processes which, otherwise, cannot be managed without fast data acquisition and control. The inherent flexibility of such systems can be employed for executing various tasks such as switching an alarm signal 'on' for warning lights, start furnaces, stop electric motors, control fuel flows and several external devices, etc.

NAL's data acquisition systems

Realizing the importance of data acquisition in the field of aeronautical, structural and other industrial activities, the National Aeronautical Laboratory (NAL), Bangalore, constituted in 1964 a small group in the Electronics Division to work on this area (The Division has now been named Systems Engineering Division). The first task of this group was to assess the immediate and long-term needs of the laboratory and industry and identify areas of research. The group was later involved, through its Data-Logging Pilot Plant, in the design, development and fabrication of various types of multi-channel data-logging systems. The laboratory slowly but steadily attained broad-based expertise in this area of R&D to cater to its own requirements and also to those of academic institutions, R&D organizations and industrial establishments in the country.

Today, NAL has earned a reputation for being the premier organization in the country in the design and development of sophisticated data-logging systems which were hitherto being imported. During the last few years, a large number of data acquisition systems, ranging from 20 to 100 channels, have been designed and built for use in diversified applications ranging from road research to complex aircraft/aerospace testing facilities. A typical data-logging system developed in the laboratory accepts low signals (millivolt level) from various transducers such as strain-gauges and thermocouples, processes the signals and finally prints/punches them out in a computer-compatible format on any desirable output peripheral equipment.

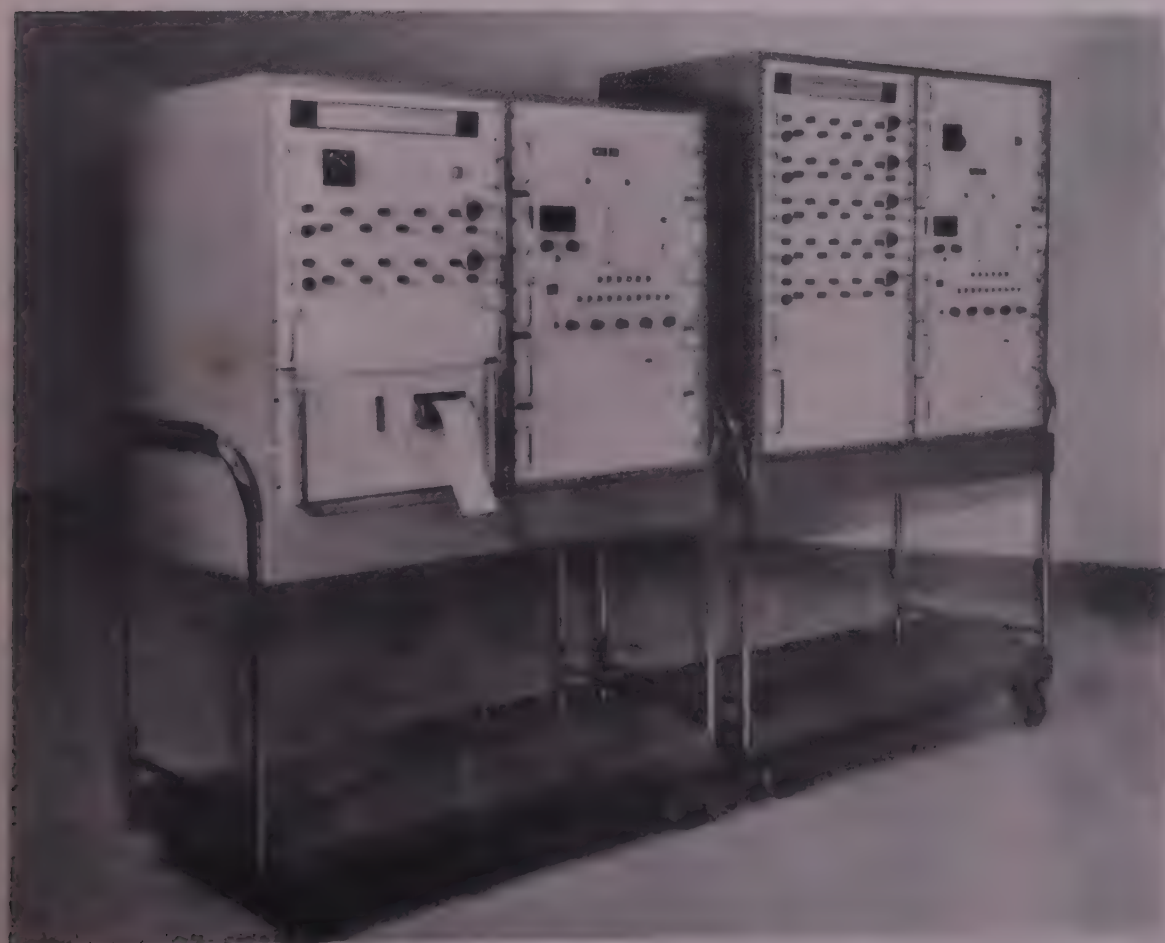
All the data-logging systems were designed with a modular approach and unlimited expansion capability. Additional number of channels, various scanning speeds, and interfacing the system to other digital equipment can be readily incorporated as and when required. The system has flexible scanning modes such as manual, auto-



500-Channel data-logging system



20-Channel data-logging system



60-Channel data-logging system

single, auto-continuous, limited single and limited continuous scales.

The analog scanner used in the system is a very high-performance signal

switching unit for multiplexing 10-500 channels of analog voltage signals at millivolt level. Several analog scanners can be driven by one data logger providing multiplexing of any number of signals. The scanning modules are of unique design and contain high performance electrochannel switches which ensure the signal integrity of better than $10 \mu\text{V}$ under most conditions.

The signal conditioner typically consists of a bridge balancing module (strain-gauge system), a high-performance low-drift instrumentation amplifier and a high-quality power supply for excitation of the transducers as well as for operation of the amplifier. Provision to include a noise filter is also incorporated. The A/D converter has a $3\frac{1}{2}$ or $4\frac{1}{2}$ digit full-scale output, depending on the requirements. The digital data output from the converter is properly coded and converted so that the data can be printed/punched out in the required format on a suitable output peripheral.

Sophisticated systems

Starting off on a small scale with the development of data-logging systems using discrete components (1968-69), the laboratory has now built up considerable capability in the design and development of sophisticated systems with unlimited expansion capability. The capability developed over the past decade has led to the development of a number of systems which otherwise would have been imported at a considerable expense of foreign exchange. The following are the examples:

A 100-channel data logging system is being used for fatigue testing of aircraft in the Structural Sciences Division of the laboratory.

A 20-channel data-logging system in the Propulsion Division is being used with the pressure scanning system.

A 500-channel data-logging system supplied to the Structural Engineering Research Centre (SERC), Madras, is being used for structural testing of complex structures like high-voltage



250-Channel data-logging system

transmission towers, grain storage silo model studies and pressure vessel model of the atomic reactor, Kalpakkam.

A 200-channel data-logging system supplied to SERC, Roorkee, is being used for structural testing of complex structures.

A 250-channel data-logging system supplied to the Central Road Research Institute, New Delhi, is being used for testing of various structural models.

Two 100-channel data-logging systems supplied to the Vikram Sarabhai Space Centre, Trivandrum, are being used for testing of structural models and temperature recording of environmental test chambers.

The most recent achievement of NAL is the design, development, fabrication and commissioning of a 256-channel

data-logging system with complete signal conditioners at the Bharat Heavy Electricals Ltd (BHEL), New Delhi, for the performance evaluation of a thermal power station. The system supplied to BHEL has been designed for the measurement of temperature, pressure, flow, voltage, current, etc. It has been indicated that if after field trials in Delhi the system proves effective, similar systems will be installed in other power stations to be built by BHEL in future.

The system basically consists of scanning modules, scanner controller, high CMR instrumentation amplifier, analog-to-digital converter, realtime clock and Hindustan teleprinter/H.P. on-line printer. The system has been designed to accept voltage signals from various signal conditioners and can

accept input signals from 256-signal conditioners. Each type of signal conditioner has been designed as a plug-in module and 8 such modules can be accommodated in a standard 19 in. chassis. All the 256-signal conditioners have been accommodated in four racks, each rack containing 64 such modules in 8 chassis. The system provides manual, automatic and limited scanning, both single and continuous, up to 256 channels of data. The printed output contains channel identification of the selected channel and the measured data. In addition, the realtime information is printed once in each scanning cycle. There is also provision to expand the number of channels up to 1000 by adding additional scanning modules.

Because of these developments, a high degree of self-reliance has been achieved in the design and development of data-logging systems.

The specifications and performance criteria of NAL systems which have been evaluated thoroughly in the laboratory are at par with the best available anywhere else in the world.

Specifications of the 256-channel data-logging system:

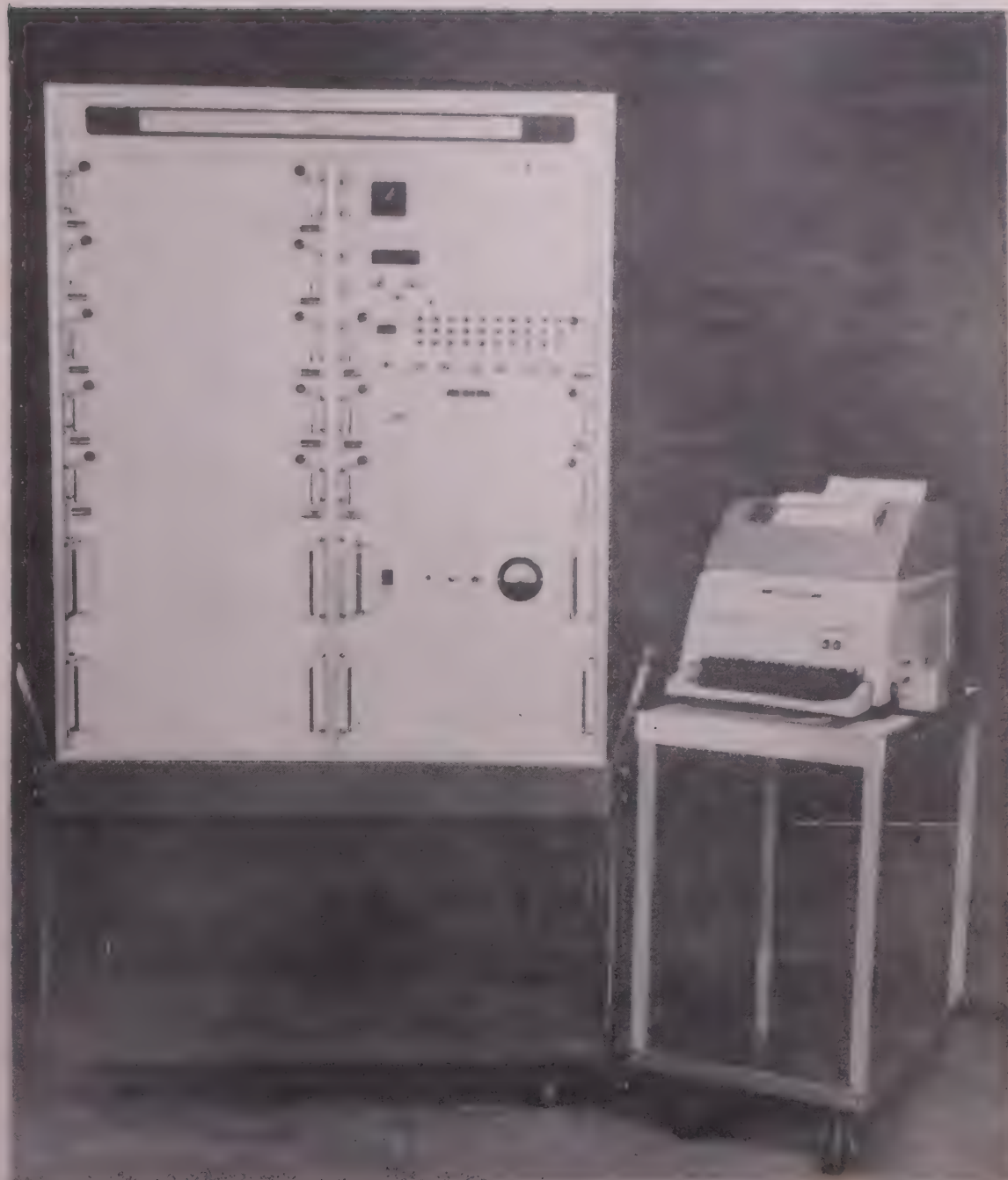
Number of channels	: 256 (expandable up to 1000)
Input	: 2-wire input from various signal conditioners
Linearity	: $\pm 0.2\%$ of reading ± 1 count
Repeatability	: $\pm 0.2\%$ of reading
Accuracy	: $\pm 0.5\%$ of reading ± 1 count
Readout information	: Realtime information in hours, minutes and seconds Channel identification: 3 digits Data amplitude: 4 digits (full-scale reading ± 1.999 V) Polarity: 1 digit
Printed data	: Realtime information in hours, minutes and seconds Channel identification: 3 digits Data amplitude: 4 digits Polarity: 1 digit
Scanning modes	: Manual Limited single scan Limited continuous scan Auto-single scan Auto-continuous scan
Scan rate	: 10, 5 & 2 channels/sec; 2 & 5 sec/channel
Power	: 230 V ac $\pm 10\%$, 50 Hz, 600 W, single phase

The 256-channel data-logging system supplied to the Bharat Heavy Electricals Ltd. New Delhi

Future programme

The custom-built data-logging systems developed in the laboratory are in wide use throughout the country. The hand-wired data logging systems so far developed have committed endurance and are suitable for 'stand alone' applications. Encouraged by the performance evaluation of these systems, the Systems Engineering Division has taken up the development of microcomputer-based data acquisition systems with ample flexibility and also the software required for the various microprocessor-based systems. These systems are not only physically compact but are also capable of a wide variety of on-line computation, such as conversion to engineering units, linearization of thermocouple outputs, and alarm sensing.

Some work on microcomputer-based data-logging systems has already been initiated. It is also envisaged to undertake design and development of an ultra-high speed data-acquisition system with throughput rates of up to 100 kHz (as compared to existing 20 kHz) for use in high-speed wind tunnels, hypersonic tunnels and shock tubes.



CSIR SUPPORT TO RESEARCH

Unsteady Magnetoplasma-dynamic Flow in an MHD Generator

Research activities in magnetohydrodynamic (MHD) electric power generation have been intensified in India under Energy Research Programmes during the last few years in consonance with the worldwide awareness for energy conservation. Some preliminary studies have already been made in India for the development of a suitable model of an MHD electric power generator. Such a system is being developed jointly by the

Bhabha Atomic Research Centre, Trombay, Bombay, and Bharat Heavy Electricals Ltd, Tiruchirapalli, in collaboration with the Institute of High Temperature, Moscow. The Department of Science and Technology is supporting the programme. One of the major tasks of this project is the development and the design of a suitable duct for the generator. This requires a thorough understanding of the various physical processes of flow phenomena in MHD channels. Though, extensive theoretical studies have been made on the basis of quasi-one-dimensional flow models,

these studies are not useful to analyze the phenomena which occur because of nonisotropic and nonhomogeneous distribution of the parameters. For this, a two-dimensional analysis of the flow problems with the anisotropic plasma properties is needed. With this objective, some investigations on unsteady flow phenomena in a magnetohydrodynamic channel were carried out at the Indian Institute of Technology, Bombay, by Shri G.H. Masapati, a CSIR research fellow working under the guidance of Dr M.L. Mittal, Assistant Professor in the Department of Mathematics. Specifically, the effects of the Hall and the ionslip currents have been analyzed in this project.

Shri Masapati carried out a study of two-dimensional unsteady plasma flow. Two cases were dealt with. The first case was concerned with the unsteady flow with specified time-dependent pressure gradients. The time response of the system due to pressure disturbances in the gas was analyzed. The Hall and the ion-slip currents produced fluctuations of transient nature in velocity and current components, whereas the fluctuations due to pressure distributions gave standing oscillations. The second case dealt with arbitrary changing flow rate. Two situations considered in details were: (i) uniform flow rate with initially uniform velocity profile, and (ii) exponential flow rate with initially, fully developed steady-state MHD profile as influenced by the Hall and the ion-slip currents. The effect of exponential flow rate on the asymptotic values (for large time, t) of the velocity profiles was found to be the same as that of increasing the Hartmann number and hence the velocity profiles got more flattened. Also, the time required to stabilize the impulsive flow situation increased with the Hall current. Thus, the Hall current had a destabilizing effect, whereas the ion-slip current had a stabilizing influence.

The developing flow and the corresponding current distributions in an MHD channel were also analyzed. Two cases of inlet velocity distribution, viz. uniform and parabolic, were considered. Small fluctuations in the velocity components were produced because of the Hall and the ion-slip currents which increase the flow entry length.

Finally, the stability analysis of such a two-dimensional MHD flow was made. The equation governing the evolution of disturbances turned out to be a sixth-order differential equation in this case compared to the fourth-order Orr-Sommerfeld equation for the ordinary MHD case. The problem was solved by the use of the asymptotic expansion method. It was found that the critical Reynolds number decreased with the Hall current but increased with the ion-slip current.

Based on these investigations, Shri Masapati has submitted his thesis for the Ph.D. degree of the Indian Institute of Technology, Bombay.

Erosion Due to Liquid Jet Impingement

The utilization of high-speed and high-head machines for power generation needs a careful selection of materials to resist erosion due to liquid impingement and cavitation. Further, the liquid jets and cavitets (jets in which cavitation is induced) have been industrially exploited for cutting and mining applications.

The objective of a new CSIR research project granted to Dr B.C. Syamala Rao, Assistant Professor, Civil Engineering Department, Indian Institute of Science, Bangalore, is to study the several characteristics of erosion due to liquid jet impingement in comparison with cavitation erosion.

The project envisages detailed and systematic analysis of the several parameters that influence erosion because of liquid impingement and a detailed photographic study of the form and nature of the liquid jet impact and of the erosion. A theoretical model for the flow issuing from a plain nozzle and a nozzle with a cavitation inducer will be attempted. Investigations using water jets with additives like polymer compounds, which yield better jet cutting efficiencies, are also planned. The study will be aimed at evaluating different materials for erosion resistance and commercially exploiting the cutting capabilities of liquid jets.

A detailed study of the comparative characteristics of erosion due to the impingement of plain jets and cavitets is now in progress.

Pollutional Effects of Industrial Wastes on Reproductive Cycling of Fresh-Water Tropical Fishes

The fertilizer factory at Gorakhpur releases effluents in the nearby Lake Chilwa, which in the past was meeting to

a great extent the localities demand for fish.

In view of the detrimental effects of the industrial wastes on the biological ecosystem, especially the aquatic ecosystem, Dr K. Pandey of the Department of Zoology, University of Gorakhpur, Gorakhpur, proposes to investigate, under a new CSIR scheme granted to him, the pollution and pollutional effects of the industrial wastes on the reproductive cycling of certain fresh water tropical fishes, especially teleosts.

The aim of the study is to predict the impact of industrial wastes on fish reproduction under normal seasonal conditions. The results of this study and of the studies already made on the effects of environmental imbalances would bring into focus the various phenomenon leading to reduction in reproductive capacity of the fishes from the Chilwa Lake and may also help in the assessment of the extent of danger to the declining fishery and to the fish-eating population consequently.

The study will be designed to analyze and evaluate the effects of various constituents of industrial wastes from the fertilizer factory on the gametogenesis, maturation, spawning and the embryo's survival to hatch. Observations would be made on morphological deformities, functional derangements, histochemical changes leading to the physiological imbalances of the reproductive cycle and their consequent effects.

Flow through Porous Media

It is a common practice to use certain polymeric additives or emulsions in the secondary and tertiary oil recovery from a petroleum field. This has acquired great importance in India. These emulsions or solutions are effective in 'pushing' the oil trapped in the smaller pores of soil near the oil field, because of their increased resistance to flow through a porous soil. Certain additives such as Polyox and polysaccharides are believed to exhibit synergistic effects.

In a new CSIR research scheme granted to him, Dr D.D. Kale, Reader in

Chemical Engineering, University of Bombay, Bombay, proposes to investigate the flow characteristics of various inelastic and visco-elastic materials through compact sintered porous discs.

The flow field is essentially characterised by elongational flow which is of significance in many chemical engineering processes. Dr Kale proposes to examine the data collected during this study and the existing data collected elsewhere on the basis of flow model comprising elongational flow field.

The studies are directly related to secondary and tertiary oil recovery from onshore and offshore sites based on the information on the effectiveness of various materials for the purpose.

Preservation of Stored Grains by Natural Volatile Compounds Against Fungal Deterioration

Preservation of grains from deterioration by fungi in storage is one of the most important post-harvest problems in the present time, particularly in developing countries like India where climatic conditions are very unfavourable for storage. In India, where modern storage facilities are inadequate, the effective application of some volatile compounds could be a better alternative to the expensive drying method or to the anaerobic, sealed storage, and thus could open up a new horizon in seed preservation. Certain volatile fatty acids (VFA) are known to prevent fungal development although at the same time they kill the grains. Nevertheless, some of these acids are now commercially used in some advanced countries as an effective method of preserving feed grains. In laboratory experiments undertaken at Uppsala, Sweden, during 1975-77, Dr B. Nandi, Professor of Botany, University of Burdwan, Burdwan, found some naturally occurring volatile aldehydes which were equally, if not more, efficient grain preservative than VFA but much less phytotoxic.

Under a new CSIR scheme granted to him, Dr Nandi proposes to evaluate antifungal efficacies of VFA and

aldehydes together with some other new potential compounds in both small and middle scale experiments to assess their practical applicability as grain preservatives under Indian conditions. The feasibility of eliminating or minimizing the mycotoxin production by lowering fungal activity in grains will also be investigated.

Conformational Analysis of Biomolecular Structures by X-ray Diffraction Methods

In a new CSIR research scheme granted to him, Dr S.G. Biswas of the Department of Physics, Visva-Bharati, Santiniketan, proposes to undertake a conformational analysis of biomolecular structures by X-ray diffraction methods.

Although conformational analysis is invaluable in the analysis of pharmacological agents, to help clarify the mechanisms by which enzymes promote chemical reactions in living cells, X-ray diffraction analysis, whenever possible, is still today the most precise source of information about these conformers.

During the last few years the chemists of the Department of Organic Chemistry, Indian Association for the Cultivation of Science (IACS), Calcutta, collaborating in this project have been engaged in the synthesis and conformation of a family of biologically active bridged-ring compounds leading to the synthesis of plant growth active hormones, some physiologically active pentacyclic diterpene alkaloids and a new group of pheromones. These compounds are interesting models for spectroscopic work as well as bond deformation studies, and they have drawn considerable attention from scientists in the recent years because of their biochemical, structural and functional importance. The structural (three-dimensional) information plays a pivotal role in the structure-activity relationships of these biomolecules. Therefore, the problem has been taken up for X-ray diffraction studies. However, the IACS scientists have

investigated at length the various conformational aspects of these organic substances synthesized in their laboratory by NMR and mass spectrometric studies which are extremely useful in the process of their X-ray investigations. The phase problem associated with the Fourier synthesis of X-ray diffraction spectra of these substances is formidable since the biomolecules contain only light atoms (carbon, nitrogen and oxygen, besides hydrogen) and it has to be solved by direct methods rather than Patterson methods.

The investigation has led to some important results related to the three-dimensional structure of a bridged-ring ketone which is the key intermediate in the synthesis of des-N-morphin, the first synthetic pheromone of a new class synthesized by the IACS scientists. This compound is a highly effective and structurally unique chemical attractant whose rigid molecular geometry is ideally suited for determining the structure-activity relationship. The three-dimensional geometry of this compound has been fully established by X-ray diffraction studies done in Dr Biswas' laboratory which is expected to shed light on the biodynamic processes involving different aspects of the functioning of this biomolecule. X-ray diffraction studies of some other members of the family of biomolecules are under progress.

PERSONNEL NEWS

Appointments/Promotions

Dr G.D. Sootha

Dr G.D. Sootha of the National Physical Laboratory (NPL), New Delhi, has been promoted, on assessment, from Scientist C to Scientist EI at NPL with effect from 8 September 1977.

Dr Sootha (born 12 Aug. 1939) did his B.Sc. (1958) and M.Sc. (1960) from the University of Agra and Ph.D. (1967) from the University of Delhi. Dr Sootha, who was a junior and senior research fellow at NPL from 1961 to 1964, joined NPL as a Scientist B in 1964 and was promoted to Scientist C in 1969.

At NPL Dr Sootha's primary research interests have been: the electrical, optical and paramagnetic properties of alkali halides; optical and electrical properties of photosensitive materials to develop materials used in electrophotography; paramagnetic properties of carbon fibres; optical and paramagnetic properties of photoconducting materials like CdS to make solar cells; and paramagnetic properties of food grains to increase their yields.

Dr Sootha has considerable contribution in the area of solar energy devices: he has developed flat-plate solar collectors capable of heating water to 90-95°C at reasonably good efficiency; solar concentrators of glass capable of giving steam at 200°C and above; a solar space-heating system; and a prototype solar pump. Dr Sootha and his group have developed a complete technical know-how for the fabrication of electrostatic photo-copying machines, for which he won the NPL Award of Merit (1970); a silver shield and a certificate of merit for import substitution of the Board of Import Substitution, India (1971); a cash award of the Invention Promotion Board, India (1971); and a gold shield of the Indian Merchants Chamber (1971). For his meritorious work he was awarded three merit increments by CSIR.

Dr Sootha has about 40 research papers/reports to his credit. He has taken out eight patents.

* * *

The following have been appointed at the National Environmental Engineering Research Institute, Nagpur: Shri R.C. Reddy (Scientist C at Cochin Zonal Laboratory; 11 Oct. 1978); Shri Arvind Ghosh (Scientist B; 23 Oct. 1978); Shri C. Chalapati Rao (Scientist B; 20 Oct. 1978); and Shri P.M. Pimperkar (Scientist B at Calcutta Zonal Laboratory; 3 Oct. 1978).

Honours

Dr S.M. Naqvi

Dr S.M. Naqvi of the National Geophysical Research Institute (NGRI),

Hyderabad, has been awarded the Mysore Geologists' Association Gold Medal by the Geological Society of India, Bangalore, for his outstanding contributions to Dharwar Geology.

Dr Naqvi is the Project Leader for geochemical research at NGRI and has carried out extensive studies since 1965 on the various problems of Dharwar Geology. In his studies, he has brought out many controversial aspects of Dharwar Geology and has generated a large amount of new data on the geochemistry of Dharwar rocks. He was the first to recognize in 1972 that there exists a pre-Dharwar cycle of sedimentation, orogeny and granitization. Dr Naqvi and his group at NGRI have brought the Dharwar Geology to the international literature and focussed the attention of Precambrian geologists on the complexities and uniqueness of the Dharwar Craton. He has authored and co-authored more than 50 papers.

PATENTS FILED

397/Del/78: A process for the biochemical leaching of copper from copper bearing materials, R.C. Gupta, M.M. Nandi & B.R. Sant—RRL, Bhubaneswar.

399/Del/78: Preparation of potassium nitrate from the mother liquor obtained after the separation of potassium cornallite from neutralized byproduct mixacid, S.N. Mahapatra, S.N. Das & P.K. Palit—RRL, Bhubaneswar.

CIMAP Regional Centre at Haldwani Shifted

The Haldwani Regional Centre of the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, has been shifted to its Nagla Farm in Khamia Block on Bareilly-Naini Tal Highway. The postal address of the centre will be: CIMAP Regional Centre, Pant Nagar P.O., Nagla Dairy, Dist. Naini Tal.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 29/78

It is proposed to appoint two Scientist F (Deputy Directors) for the Central Leather Research Institute, Madras.

Job requirements: For post (i): The incumbent should have ability to plan, programme, conduct, correlate, direct and sell research; and to interact with industry and other organizations connected with leather industry. The incumbent is expected to assist the Director in the day to day administration of the industry.

For post (ii): The incumbent is required to organize research and guide workers in the field of leather technology and to provide necessary assistance to industry in the production development of various types of finished leathers and to assist the Director in the day to day administration of the institute.

Qualifications: For post (i): High academic qualifications with up-to-date knowledge of leather manufacture and conditions obtained in the leather and allied industries in India and abroad. Proven record of research in the field of leather technology as evidenced by research publications monographs books, etc.

For post (ii): High academic qualifications followed by proven ability of vast experience in the production development of various types of finished leathers in a tannery in all operations as evidenced by research publications/monographs/books, etc. Experience in diverse fields connected with science technology, trade/commerce of leather is required.

Salary/Conditions of Service: The salary scale attached to the above posts is Rs 2000-125 2-2500. Initial pay will be fixed according to merits. The persons selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the posts. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Scientists technologists interested may obtain two copies of the standard proforma for sending their curriculum vitae from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed curriculum vitae proformae will be received in this office on or before 18 January 1979.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.



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ABBREVIATIONS USED

ATIRA	Ahmedabad Textile Industry's Research Association	CMERI	Central Mechanical Engineering Research Institute	NCL	National Chemical Laboratory
BITM	Birla Industrial & Technological Museum	CMRS	Central Mining Research Station	NEERI	National Environmental Engineering Research Institute
BTRA	Bombay Textile Research Association	CRI	Cement Research Institute of India	NGRI	National Geophysical Research Institute
CBRI	Central Building Research Institute	CRRI	Central Road Research Institute	NICDAP	National Information Centre for Drugs & Pharmaceuticals
CDRI	Central Drug Research Institute	CSIO	Central Scientific Instruments Organisation	NIO	National Institute of Oceanography
CECRI	Central Electrochemical Research Institute	CSIR	Council of Scientific & Industrial Research	NML	National Metallurgical Laboratory
CEERI	Central Electronics Engineering Research Institute	CSMCRI	Central Salt & Marine Chemicals Research Institute	NPL	National Physical Laboratory
CFRI	Central Fuel Research Institute	IIEI	Indian Institute of Experimental Medicine	NRDC	National Research Development Corporation of India
CFTRI	Central Food Technological Research Institute	IIP	Indian Institute of Petroleum	Pat.	Patented invention
CGCRI	Central Glass & Ceramic Research Institute	IJIRA	Indian Jute Industries' Research Association	PID	Publications & Information Directorate
CIMAP (CIMPO)	Central Institute of Medicinal & Aromatic Plants (old name: Central Indian Medicinal Plants Organisation)	INSDOC	Indian National Scientific Documentation Centre	RRL	Regional Research Laboratory
		ITRC	Industrial Toxicology Research Centre	SASMIRA	Silk & Art Silk Mills' Research Association
		NAL	National Aeronautical Laboratory	SERC	Structural Engineering Research Centre
CLRI	Central Leather Research Institute	NBRI (NBG)	National Botanical Research Institute (old name: National Botanic Gardens)	SITRA	South India Textile Research Association
				TRA	Tea Research Association
				VITM	Visvesvaraya Industrial & Technological Museum



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

MERADO (Ludhiana) Develops Automatic Hand-Knitting Machine and Other Machines

The Mechanical Engineering Research and Development Organisation (MERADO), Ludhiana, has designed and developed an automatic hand-knitting machine. The machine has been commercially manufactured by a local firm using the MERADO know-how and will be marketed at Rs 2000, which is about Rs 1200 less than the price of the only other similar machine being manufactured with foreign technical know-how and marketed at present.

The machine developed by MERADO can knit garments in self and multi-colour designs in plain, tuck and slip stitches. It has a stainless steel needle bed containing 200 plated knitting needles to make garments wide enough to fit 140-cm chest or hip. A simple and compact mechanism mounted on the knitting carriage automatically selects needles in a predetermined pattern which can be selected by the turn of a knob. The patterns can also be shifted laterally (sidewise both ways) from one stitch to eight stitches. The machine is

provided with push buttons to select one of the four needle cam tracks to bring the needles to knit, tuck, slip or hold-on positions.

The machine requires very little repair and maintenance. As it is mechanically operated and does not incorporate any magnetic device, the machine is rugged in construction and has a longer service life. To ensure light running of the machine and long life, antifriction bearings are provided on all rotating shafts.

The ruggedness of the machine and its low price make it ideal for commercial use by housewives, in rural as well as urban areas, to augment their family income. The income from the machine covers the cost of the machine in 3 or 4 months. The machine will be a boon to the unemployed and the weaker sections of the society to attain self-employment at a low investment.

The machine has a vast potential for export to the neighbouring countries and other underdeveloped countries. It

will also aid the knitwear export industry in the production of children's knitwears for export.

MERADO's Other Contributions

Recently, MERADO developed two embroidery machines which are being manufactured and marketed by a local firm. An improved version of circular knitting machine is being designed.

The centre has developed such sophisticated machines as single-spindle automatic turret lathe (with auxiliary cam shaft) and a radial drilling machine.

MERADO has also helped the export-oriented hand-tool industry by designing and fabricating their requirements of jigs and fixtures as well as of test rigs for inspection and quality control.

With the technical expertise provided by MERADO, some of the local small-scale foundries have started producing quality- and graded-castings for sugar mill crushing rolls, IC engines, automobile components, and machine tool castings.

MERADO, Ludhiana, has plans to take up the development of a punch card



The automatic hand-knitting machine developed by MERADO, Ludhiana. The machine can knit garments in self and multi-coloured designs in plain, tuck and slip stitches

type automatic knitting machine to be followed by a machine with automatic fashioning facility. Other hosiery industrial sewing machines to be developed in a phased developmental programme are: high-speed overlock machine, button-hole machine, and electric cloth-cutting machine. •

Unesco-PID Training Course on Science Editing

An eight-day training course on editing of scientific journals, sponsored and financed by the Unesco Regional Office for Science & Technology for South & Central Asia, was organized and run by the Publications and Information Directorate (PID), New Delhi, during 20-28 November 1978. Inaugurating the course, Dr A.R. Verma, Director, National Physical Laboratory, New Delhi, drew attention to the increasing importance of the role of science editor in the process of communication of scientific and technological information in the context of the explosive rate of generation of new information. He expressed satisfaction at the manner in which PID had all along shown awareness of the need of research workers for outlets for their communications and had never hesitated to start a new journal when the research community in a particular discipline expressed the need for it. He complimented the Unesco authorities for providing editor-participants in the training course, through PID, an opportunity to familiarize themselves with the latest techniques of handling and processing information.

In her address delivered at the inaugural session, Dr (Mrs) M. Vannucci of Unesco Regional Office gave details of the policies and programmes of Unesco in the field of information communication. Shri Y.R. Chadha, Chief Editor, PID, and course director, provided a bird's-eye view of the activities of PID, in particular those pertaining to the handling of nascent information.

Important among the topics covered in the course were: (1) Organization of

primary and secondary scientific periodicals; (2) Evaluation and editorial practices for scientific and technical manuscripts; (3) Tabular and graphical presentation of data; (4) Preparation of abstracts; (5) Presentation of text material; (6) Linguistic aspects; (7) Quality of scientific periodicals; (8) Future of scientific periodicals; (9) Preparation of technical reports; and (10) Production aspects. The faculty for the course comprised Shri Y.R. Chadha (PID), Shri R.D. Taneja (Indian Standards Institution, New Delhi), Shri R.N. Sharma (PID), Shri P.S. Shankar (PID), Shri S. Arunachalam (PID), Shri T.N. Rajan (Insdoc), Shri V. Ramachandran (Insdoc) and Shri P.N.M. Menon (PID).

The participants in the course included two from Bangladesh, one each from Afghanistan, Sri Lanka and Pakistan, and ten from India.

At the concluding session held on 28 November, Mr Aung Gei, of the Unesco Regional Office, handed over certificates to the participants.

CSMCRI's Training Course on Desalination

The Central Salt & Marine Chemicals Research Institute, Bhavnagar, organized a short-term training course on desalination during 6-15 November 1978. Prof. R.S. Mehta, Chairman, Water Pollution Board, Government of Gujarat, inaugurated the training course, which was attended by 17 engineers from different parts of the country.

The aim of the training course, second in the series organized by CSMCRI on this topic, was to acquaint the participants with the R & D work being carried out by the institute on various desalination techniques. The course covered lectures and practical demonstrations on electrodialysis, reverse osmosis, solar distillation, flash distillation, and water softening. Some related subjects like water treatment methods, scale formation and removal, and engineering aspects of various techniques were also dealt with.

Information Centre for Food Science and Technology

The National Information Centre for Food Science and Technology has started functioning, under the National Information System for Science and Technology Programme of the Department of Science and Technology, at the Central Food Technological Research Institute, Mysore [CSIR NEWS, 27(1977), 161]. At present, the centre provides the following services: (1) Food Technology Abstracts (monthly); (2) Food Digest (quarterly); and (3) Selective Dissemination of Information (fortnightly).

Two bibliographies have also been published: (1) Storage of Foodgrains in India: 1945-72, which includes 940 references with abstracts under three major headings, viz. Handling and Storage, Insecticides and Control Measures, and Entomology; and (2) Technology Transfer, which includes more than 700 references on technology transfer.

Deputation Briefs

Dr J.K. Maheshwari of the National Botanical Research Institute (NBRI), Lucknow, visited UK, on deputation, to participate in the International Legume Conference held at the Royal Botanic Gardens, Kew, UK, from 24 July to 4 August 1978. About 175 specialists from 30 countries presented at the conference invited papers which covered broadly the classification and utilization of legumes. The botanical programme was directed towards an improved classification of the Leguminosae at generic and tribal levels from a synthesis of diverse evidence. The agronomic programme was devoted partly to selected general topics including diversity, adaptation, yield, water relations, nitrogen fixation, biochemical composition and nutritional factors in legume crops, and partly to reviews of selected groups of legume crops, principally *Arachis*, *Glycine*, *Phaseolus*,

Psophocarpus, *Vigna*, *Cicer*, *Lens*, and also fodder and cover legumes (e.g. *Stylosanthes*, *Centrosema*, *Trifolium*, *Medicago*) with particular reference to structure, genetic diversity, evolution, classification and breeding. Dr Maheshwari presented an invited paper on extrafloral nectaries of legumes. He also attended the third meeting of the International Group for the Study of Mimosoideae held at Kew on 31 July and 1 August 1978.

Dr Maheshwari also visited gene bank units and plant conservation

research centres at the Royal Botanic Gardens, Wakehurst Place, Ardingly, Sussex; Royal Botanic Garden, Edinburgh; University Botanic Garden, Cambridge; Biological Records Centre, Monks Wood Experimental Station and Nature Conservancy Council, Huntingdon; British Museum (Natural History), Royal Botanic Gardens, Kew; and Botanic Garden, Oxford, and studied the conservation policies and programmes launched in UK to save the rare and endangered flora from extinction.

distribution in the former. Packed columns are extensively used for gas absorption. A typical example of industrial importance is the removal of hydrogen sulphide, sulphur dioxide, ammonia, etc. from industrial emissions. Packed columns also find application as process reactors for the manufacture of various compounds and as distillation columns for separating the various components of a liquid mixture. Packed bubble columns are considered to be a substitute for bubble columns for many applications wherein backmixing is not desirable. In all these cases, the mass transfer characteristics of the packing used determine the performance of the columns. To improve these characteristics, several packings have been tried and used by Pangarkar.

In many absorption applications, the pressure drop on the gas side manifests itself as the energy consumed and enhances the operating costs. In packed columns, stacked beds of packings (i.e. regular arrangement) are known to give a lower pressure drop than randomly packed beds. On these lines regular packings made from various patterns of metallic wire mesh, gauze or sheet, like Goodloe and Sulzer packings, have been developed, and these give very low pressure drops. Conventional packings have very poor performance at low superficial velocities of liquid, whereas regular packings are expected to perform much better because of capillary action which tends to spread the liquid over the entire packing surface. Regular packings made from corrosion-resistant synthetic materials like polypropylene are expected to find more use in gas absorption applications in which highly corrosive conditions obtain. However, these packings are known to suffer from initial liquid maldistribution which has a detrimental effect on their performance. Thus the design of liquid distributors is very critical. For tall columns, redistributors are necessary to correct the liquid distribution.

This project, which aims at studying the liquid distribution in the above-

CSIR SUPPORT TO RESEARCH

Instabilities in MHD Power Generator

A study of plasma instabilities is important in the development of MHD devices like generator and accelerator, since instability increases the effective impedance of the generator and therefore reduces its performance characteristics.

Under a new CSIR research scheme sanctioned to him, Dr M.L. Mittal, Assistant Professor, Indian Institute of Technology, Bombay, proposes to study the various instabilities and their effect on the performance of the MHD generator. Most of the earlier investigations were based on quasi-one-dimensional models. To investigate the influence of the Hall and the ion-slip currents on the stability characteristics, Dr Mittal will study the problem using a two-dimensional model.

Initially, Dr Mittal will carry out a two-dimensional analysis of the linear stability of a developing flow in an MHD generator. Equilibrium solutions for such a flow have already been found in a recently completed CSIR research scheme titled 'Unsteady magnetoplasma-dynamic flow in an MHD generator'. The nonlinear instability which may arise because of superheating and the force analogous to free convection in a gravitational field will be analyzed. This type of instability arises in a generator because of ponderomotive force.

Further, these studies will be extended to non-equilibrium plasma, because a partially ionized, non-equilibrium plasma in a magnetic field is susceptible to the electrothermal or ionization instabilities. Most of the investigations of this type are made for argon plasma used in a closed cycle MHD generator. By controlling the seed percentage or by imposing high-frequency electric fields, it is possible to stabilize the plasma. In an open cycle MHD generator, which uses coal gases seeded with potassium, ionization instabilities may exist because of the presence of negative ions, etc. Owing to the high temperature of the coal gas, chemical reactions also take place. These effects can give rise to a significant dissipation of energy. Therefore, it is important to take these effects into account in studying the instabilities in the MHD power generator.

Performance of Regular Packings: Evaluation of Mass Transfer Characteristics and Study of Liquid Distribution

In a new CSIR research scheme granted to him, Dr V.G. Pangarkar of the Department of Chemical Technology, University of Bombay, proposes to evaluate the mass transfer characteristics of regular packings and packed columns and to study the liquid

mentioned packings, is expected to provide information on the proper design of liquid distributors and the need for redistributors. The studies will be carried out in columns of varying diameters so that the scale-up criteria can be predicted. Other mass transfer characteristics like the gas and liquid, side mass-transfer coefficients and the effective interfacial area will also be studied for both packed and packed bubble columns.

Structure and Physicochemical and Mechanical Properties of Borate, Phosphate and Chalcogenide Glasses

Although many of the technical glasses are relatively complex, an understanding of the factors controlling glass formation is more readily obtained by a study of simpler systems. In a new CSIR scheme sanctioned to him, Dr H.N. Bhargava, Reader, Department of Chemistry, Gorakhpur University, Gorakhpur, proposes to study a number of such simple inorganic glass-forming systems as the borate, phosphate and chalcogenide glasses.

Work already carried out by Bhargava and his associates on sodium-containing copolyphosphates of the type $\{a(\text{NaPO}_3)b(\text{MPO}_3)_q\}_n$ (where $a:b$ is the ratio of the units NaPO_3 and MPO_3 , and q is the valency of the cation M) have yielded interesting results on the dependence of transition temperatures like T_g , T_m and T_c (glass-transition, melting, and crystallization temperatures respectively) on a number of factors. These results support as well as challenge some of the theories developed in recent years for glass-forming systems. Copolymers like those mentioned above can act as model systems for predicting the behaviour of more complex glasses. It is proposed to prepare many such copolymeric glasses and characterize them by thermal analysis, IR spectroscopy and polymer physics.

Borophosphate glasses, prepared by combining borate and phosphate glasses, are also being studied.

Grinding of Metals by Vibration Mill

In India, fine powders of aluminium metal are produced through wet grinding in a conventional ball mill. The process is rather slow and consumes an enormous amount of energy. The main advantages claimed for the vibration mill over the conventional ball mill are higher production rates, lower capital investment, finer and more uniform product sizes, and lower power consumption.

In a new CSIR research scheme granted to them, Dr M. Ramanujam and Dr R. Vedaraman of the Department of Chemical Engineering, Indian Institute of Technology, Madras, propose to explore the possibility of employing vibration mill in place of the conventional ball mill for grinding metal powders, which are widely used in India in pyrotechniques, paints, detonators, solid rocket propellant, etc.

The investigations, to be carried out on a laboratory scale and involving grinding tests with three different laboratory sizes of vibration mill, will comprise the following phases: (i) to find out the possibility of employing vibration mill for grinding of metals in wet condition, (ii) to determine the suitability of dry grinding of metals under an inert atmosphere, (iii) to establish a suitable grinding aid and its optimum concentration for grinding of metals in dry condition under an inert atmosphere, and (iv) to determine the optimum conditions of various parameters involved in the design of industrial-size vibration mills.

Geohydrological Studies in Thiruvannamiyur-Covelong Basin

Groundwater of good quality occurs in the silica sand horizon of the Coramandal series in a narrow stretch ($20 \times 1 \text{ km}^2$) between Thiruvannamiyur and Covelong bounded by the Buckingham Canal on the west and the Bay of Bengal on the east. Its main recharge is by the infiltration of rainfall. During the acute drought conditions in 1975 the drinking water requirement of

the Madras City was partly met from this aquifer by pumping from shallow wells constructed in this belt. Because of the steady increase in the population of the city and demand for the drinking water supply, it is necessary to investigate the groundwater potential of this aquifer and determine maximum pumping rates for conserving the groundwater and at the same time prevent sea-water intrusion into the aquifer. In a new CSIR research scheme granted to him, Dr R. Sakthivadivel, Professor of Hydraulics, College of Engineering, Guindy, Madras, proposes to study this aquifer belt with reference to rainfall particulars and water-table fluctuations and develop digital models to determine the optimum pumping rates necessary to make maximum use of this aquifer and at the same time prevent sea-water intrusion into it.

Development of a Stratified Charge Combustion Engine Using Differential Carburetion

The concept of stratified charge combustion engine is a promising one because of the advantages of fuel tolerance, part load economy and decreased exhaust emissions associated with it. Charge stratification techniques with fuel injection have indicated problems of initially coordinating the fuel-spray characteristics with air swirl and spark timing, resulting in unsatisfactory variable-speed performance. On the other hand, stratification by differential carburetion technique has shown better combustion stability and improved variable-speed performance.

In a new CSIR research scheme granted jointly to them, Prof. K. Mahadevan (principal investigator) and Dr B.S. Samaga and Shri F.G. Kadoli (co-investigators) of the Karnataka Regional Engineering College, Surathkal, propose to carry out experimental and analytical investigation on such a system to study the influence of operating parameters on the combustion process and to arrive at an optimized combustion chamber design. They also propose to compare this

technique with stratification using fuel injection into the pre-chamber and lean mixture carburetion into the main chamber.

Unlike almost all alternatives for the current problems of fuel crisis and atmospheric pollution, this concept fits relatively well into the existing production facilities with a minimum cost of additional investment. This is an important factor since crores of rupees are tied up in the existing engine production equipment.

Preferential Solvation of Ions in Mixed Solvents

Preferential solvation—homoselective or heteroselective—of ions in binary mixtures significantly influences many chemical phenomena, such as the rates of chemical reactions, solubilities, redox potentials, and stability constants. Apart from its fundamental significance, selective solvation can be of considerable technological value in electrorefining and electrowinning.

In a new CSIR research scheme granted to him, Dr C. Kalidas, Assistant Professor, Department of Chemistry, Indian Institute of Technology, Madras, proposes to undertake a detailed study of the selective solvation of some ions like Ag^+ and Cu^+ in a few mixed solvents like DMSO-water and acetonitrile-water mixtures. The nature of the preferential solvation will be characterized by the transfer free energy of the ions in the chosen solvents, and the solvent transference number in these mixtures. Attempts will also be made to test the current theories on ion solvation by applying the results obtained earlier. Laboratory-scale experiments will be carried out on the electro-deposition of the ions from suitable non-aqueous baths to assess the advantages of such methods over the conventional methods.

Biologically Active Plant Products and Plant Insecticides

The major objective of a multi-disciplinary project undertaken by

Dr Avijit Banerji, Lecturer, Department of Pure Chemistry, Calcutta University, Calcutta, under a new CSIR research scheme granted to him, is to develop some new plant insecticides from indigenous flora. Investigations have been started for isolating the active principles from a number of indigenous *Piperaceae* plants whose crude extracts exhibit pesticidal properties. Structural and synthetic studies on these compounds will be undertaken to gain knowledge about their structures. Particular attention will be paid to the alkamides isolated from *Piperaceae* species, as these seem to possess the greatest potential for development as insecticides. It is also proposed to synthesize a number of these naturally occurring alkamides, as well as their geometrical and optical isomers and close analogues.

The pesticidal properties of all the compounds obtained in the course of the investigation will be tested. Attempts will be made to rationalize the data thus obtained to arrive at structure-activity relationships.

Many of the *Piperaceae* plants under investigation are well known in folk medicine as useful drugs. The compounds isolated from these species in this laboratory will be subjected to chemical and pharmacological studies with a view to developing new drugs and drug intermediates.

Graft Copolymerization of Starch with Vinyl Monomers

The properties of graft copolymers depend on the nature of monomer, and number and length of the side chains. The graft frequency and segmental length of the graft copolymers markedly influence the properties like solubility, stability, and mechanical and rheological behaviour of the copolymers. Hence, it is important to control the graft frequency and graft segment length to achieve a particular series of characteristics.

Graft copolymers of starch have several potential applications. They

have been used as thickening agents, paper additives, flocculents for a number of clay and ore suspensions, as ion exchangers and disposable plastic materials. Under a new CSIR research scheme granted to them, Prof. I.K. Varma, Coordinator, School of Material Science & Technology, Indian Institute of Technology (IIT), Delhi and Dr N.K. Sandle, Assistant Professor at IIT's Chemistry Department, propose to investigate the graft copolymerization of vinyl monomers with starch by the use of ceric ammonium nitrate in nitric acid as the initiator. The effect of the concentration of reagents (i.e. monomer, initiator, etc.), the reaction time and temperature on the rates of grafting will be investigated with a view to optimizing the conditions of graft copolymerization. The extent of grafting will be evaluated by the usual methods. It is proposed to characterize the various graft copolymers of starch and thus arrive at a structure-property correlation in terms of the nature of monomer, grafting frequency and size of grafts. The stability of the grafted copolymers towards various agencies (heat, light, chemicals and enzymes) will also be investigated.

Synthesis of Heterocyclic Systems

In a new CSIR research scheme sanctioned to Dr C.K. Ghosh of the Department of Biochemistry, Calcutta University, Calcutta, it is proposed to undertake a detailed study of the reactions of chromone systems (which can conjugate with the 2,3 double bond of the pyrone ring) with various bisnucleophiles as hydrazine, monosubstituted hydrazine, hydroxylamine, enamine, amidine, and with some reactive methylene compounds. Apart from their mechanistic importance, these reactions will lead to the formation of some novel heterocycles fused with the pyran ring of 1-benzopyran. It is also proposed to test at the Central Drug Research Institute, Lucknow, the biological activities of the new heterocyclic compounds.

Cervical Factors in Infertility

Various cervical factors responsible for infertility in humans were investigated by Dr (Mrs) Mohini Shahani, a CSIR research fellow, who worked at the Department of Obstetrics & Gynaecology, Rajendra Medical College, Ranchi. Dr Shahani found that proper angulation of the cervix in the vagina is a necessary precondition for fertility. A suitable surgical correction in cases where the angulation is disturbed was found helpful. Chronic cervicitis and cervical erosion were found to have adverse effect on fertility and their control proved beneficial in cases of infertility. Low protein content and alkaline pH of the cervical mucus were found favourable to spermatozoa in all respects and therefore conducive to pregnancy. Although the total protein content could not be controlled, the pH could be changed, at least temporarily, by an alkaline vaginal douche.

Dr Shahani was awarded M.S. degree by the Ranchi University for her thesis based on the work.

PATENTS ACCEPTED

Indian Pat. 67/Del/76

A process for the isolation of pure galactose-binding proteins RCA_I and RCA_{II}

P.S. APPUKUTTAN, A. SUROLIA & B.K. BACHHAWAT
Indian Institute of Experimental Medicine,
Calcutta

RCA_I and RCA_{II} are two galactose-binding lectins present in the seeds of castor beans (*Ricinus communis*). Lectins are proteins extensively used at present in the biological field for the study of cell-surface composition, isolation and characterization of glycolipids and glycoproteins and in the study of mitogenesis. RCA_I is used in agglutination studies. RCA_{II} is a potent toxin which inhibits eucaryotic protein biosynthesis and is a useful cancerostatic agent.

Both these lectins are at present isolated by affinity chromatography on Sepharose (agarose). The process developed at the Indian Institute of Experimental Medicine, Calcutta, and covered by the patent, enables their

isolation by affinity chromatography on cross-linked guar gum. Guar gum, a galactomannan from the beans of *Cymopsis tetragonolobus*, is cross-linked using epichlorohydrin and alkali to get an insoluble matrix for chromatography. The lectins bound to the matrix is eluted with lactose.

Guar gum is much cheaper than Sepharose and is available in plenty in India. The capacity of the cross-linked guar gum to bind the lectins is 100 times that of Sepharose on dry weight basis. Production of 1 g of RCA_I and 2 g of RCA_{II} costs, on a rough estimate, about Rs 1400. The present market price for the same is more than Rs 61,000.

Indian Pat. 701/Cal/75

Improvements in or relating to the process of hard anodizing of aluminium and its alloys in sulphuric acid electrolyte using alternating current

B.A. SHENOI, V. BALASUBRAMANIAN & S. JOHN
Central Electrochemical Research Institute,
Karaikudi

Alternating current has not been employed for hard anodizing except for superimposition of ac over dc for rapid building up of oxide film and for continuous wire anodizing.

When ac is used for hard anodizing in sulphuric acid electrolyte the electrolyte decomposes and sulphur and its compounds are produced and these get embedded inside the pores of the anodic oxide film. Thereupon the anodizing voltage shoots up and the oxide film becomes streaky and pitted. Hence, deposition of oxide film of more than 8 μ m in thickness is not possible with ac.

This patented invention overcomes these drawbacks by a suitable modification of the anodizing electrolyte. The modified sulphuric acid hard-anodizing bath using ac developed by the laboratory has the following advantages: (i) High current densities can be used without detrimental effects such as burning, streaking and pitting of the oxide film; (ii) The duration of anodization can be reduced since high current densities are possible; (iii) Cast aluminium alloys can be anodized; these are normally difficult to process using dc to

any reasonable film thickness and exhibit poor corrosion resistance after dc anodization; (iv) The method would offer the opportunity for anodizing in a box of electrolyte with no cathode plates or other encumbrances. This would lead to high volume production since the entire metal in the tank is anodized utilizing the whole volume of the electrolyte; and (v) The cost of electrical equipment for ac anodization is lower than that for dc anodization since only a step-down transformer and a voltage regulator are required.

Indian Pat. 1699/Cal/76

A process for the preparation of cervical dilators
R.C. NANDI, J.P.S. SARIN, B.S. SHETTY, V.P. KAMBOJ &
N.M. KHANNA
Central Drug Research Institute, Lucknow

This patent covers a process for the preparation of cervical dilators using *Plantago ovata* (Isapgol) seed husk, which may be used for dilation of the cervix for various gynaecological operations, including medical termination of pregnancy.

In this process, compressed cores made from granulated isapgol seed husks are enclosed in suitable cloth tubes and compressed again to give cylindrical stick-like devices of different sizes. The size of the core and consequently that of the device can be varied according to the clinical requirement. The device is then sterilized.

The device involves the use of isapgol seed husk which grows abundantly in Gujarat, Rajasthan and other parts of India. In fact, India is the largest producer of this agricultural product.

This device is a substitute for the imported Laminaria tent and is much cheaper and easy to manufacture. Its use does not pose any clinical hazard and field trials in nearly 500 patients have been entirely successful.

Indian Pat. 1816/Cal/76

A process for the preparation of chromic oxide
S.B. RAO, S.K. MANDAL & B.R. SANT
Regional Research Laboratory, Bhubaneswar

The process covered by this patent relates to the preparation of chromic

oxide suitable as an abrasive for ball-bearing industry and as a polishing agent for glass, lens and mineral specimens.

Chromium sesquioxide or chromic oxide (Cr_2O_3) is the most stable oxide of chromium and is used as a pigment, catalyst colouring agent for glass, abrasives, etc. It can be produced in different physical forms under different conditions of preparation. Ball-bearing industry is known to use chromic oxide of certain purity and fineness and presently such a material is imported. In the RRL process, alkali metal bichromate is reduced in solid state by a reducing agent such as a polysaccharide. The resulting oxide is given a suitable thermal treatment to produce abrasive-grade chromic oxide.

The material has been tested and found satisfactory by ball-bearing industry and by glass and lens polishing units. Geological and mineralogical laboratories have found the product very useful for polishing mineral samples.

Indian Pat. 1758/Cal/76

A process for the preparation of a new slow release herbicide to control *Parthenium hysterophorus* Linn.

B. THAYUMANUAVAN, H.R.S. JAGTAP, A.B. TARKUNDE, K.G. DAS & B.D. TILAK
National Chemical Laboratory, Pune

The process covered under this patent consists in binding a well-known and cheap herbicide to a cheap, naturally occurring biodegradable polymer. The formulation when applied to the soil before the monsoon in June will prevent the germination of *Parthenium* but will allow grasses to grow profusely. The active ingredient is released from the formulation at a controlled rate for more than 90 days. Damage to crops and to the environment is minimal. A single application has the same effect as two conventional applications. The cost of application will be Rs 40 per acre.

The product has been found to be useful in controlling dicot weeds in many crops such as rice, wheat, sugarcane, jowar, bajra and groundnut. The cost of application will be Rs 15 per

acre. The product is now granulated for ease of application. Data on bio-efficacy and toxicology are being collected for registration of the product. Elaborate multilocal field trials were carried out last year and are being continued this year in India and abroad.

Indian Pat. 23/Del/76

Improved continuous high-pressure process for hydrogenation of glucose to produce sorbitol

P.H. BRAHME & R.P. VERMA
National Chemical Laboratory, Pune

Sorbitol, a polyhydric alcohol, is a versatile chemical which is commercially used in a variety of physical and chemical processes. It is widely used as a softener and a humectant. Its esters and derivatives are used in protective coatings, plasticizers, emulsifiers, detergents, etc. However, its major use is in the synthesis of vitamin C.

The commercial synthesis of sorbitol (India's annual demand, 9000 tonnes) is based on the catalytic hydrogenation of glucose using both batch and continuous processes. It is manufactured in India by a batch process. This process has several drawbacks. Owing to high temperature and prolonged time of reaction the products of reaction are decomposed to some extent, giving rise to the discoloration of the solutions and formation of acidic products. These acidic products cause partial dissolution of the catalyst and corrosion of the autoclave. The catalyst thus rapidly loses its activity and the yield of sorbitol is low. Further, the quantity of catalyst and the size of the reactor are greater than those required for a continuous process.

The process covered by this patent overcomes these drawbacks, as the hydrogenation is carried out continuously under such conditions as to maintain the catalyst at maximum activity and at useful life with a maximum conversion of glucose to a product of high quality.

This is also an improved continuous high-pressure process for the

hydrogenation of glucose to sorbitol in the presence of Raney nickel catalyst. It consists in continuously feeding a preheated slurry of catalyst and promoter (such as magnesium powder) in a solution of glucose to a reactor system. The reactors are maintained at hydrogenating temperatures of 100-200°C and pressures of at least 70 kg/cm², by continuously feeding preheated hydrogen concurrently, and continuously removing the hydrogenated slurry. The excess hydrogen is continuously separated from the hydrogenated slurry and recycled after it is made up. The hydrogenated solution is further processed (separated from catalyst, de-ionized and concentrated) and a colourless 70% sorbitol solution is obtained in conformity with B.P. codex specification. The extent of reduction of glucose to sorbitol is 99.8% and the overall yield is 95%. The catalyst separated from the hydrogenated solution is reused in successive runs. The actual catalyst consumption is less than 0.1% on the weight of glucose.

Developed for the first time in India, this continuous process has certain advantages over other continuous processes developed elsewhere in the world for the production of sorbitol from glucose. The main advantages of the process are economy in catalyst consumption, high conversion, better yield and better quality of product.

PATENTS SEALED

1193/Cal/74 (142590): Normal beam probes for ultrasonic non-destructive testing, V.N. Bindal & V. Gogia—NPL, New Delhi.

2327/Cal/74 (142650): Pencil-type coating thickness gauge, S. Jain & B.C. Adhikari—CMRS, Dhanbad.

1769/Cal/75 (142698): A device for picking up vibrations such as voice signals directly from throat, P.K. Chakrabarty, M.R. Kapoor, K.D. Pavate & A. Singh—CEERI, Pilani.

1611/Cal/75 (142968): An improved process for vacuum deposition of

aluminium on substrates, A. Singh & Y.K. Jain—CEERI, Pilani.

465/Cal/75 (144674): Improvements in or relating to acid pickling of ferrous items, K.S. Rajagopalan, R. Srinivasan, N. Krithivasan, C. Rajagopal, M. Sethukhumari, M.E.K. Janaki & P.S. Mohan—CECRI, Karaikudi.

PERSONNEL NEWS

Appointments/Promotions

Smt. Santosh Mehtani, Shri S.K. Rastogi, Dr V.K. Agarwal and Dr L.M. Mathur of the Publications & Information Directorate, New Delhi, have been appointed, on promotion, Scientist B at the directorate (14 Dec. 1978).

Honours & Awards

Shri Ahmad Khan of the National Environmental Engineering Research Institute, Nagpur, has been awarded a diploma in chemistry of marine pollution by the University of Liverpool, UK, for his study carried out at the university during the tenure of a fellowship.

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Prof. B.K. Bachhawat, Director, Indian Institute of Experimental Medicine (IEM), Calcutta, has been elected President of the Council of the Indian Association for the Cultivation of Science, Calcutta; for a three-year term from March 1978.

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Dr S.C. Pakrashi of IEM, Calcutta, has been nominated member-secretary of the group set up by the Union Ministry of Petroleum, Chemicals and Fertilizers (Department of Chemicals and Fertilizers) for identification of projects to be undertaken by nationalized/taken-over drugs and pharmaceuticals units in the eastern sector.

Shanti Swarup Bhatnagar Prizes (1979) for Science & Technology

Nominations are invited for the Shanti Swarup Bhatnagar Prizes for the year 1979.

The prize, the highest and most coveted award conferred on the scientists and technologists in India, was instituted in 1957 by the Council of Scientific & Industrial Research (CSIR) in the memory of its first Director and architect, the late Dr Shanti Swarup Bhatnagar and is given each year for outstanding contributions in science including engineering and technology. The award is for research contributions made primarily in India during the five years preceding the year of the prize. Only scientists/technologists who are 45 years of age or less are eligible for consideration.

Five or more prizes, each of Rs 20,000, are awarded annually for notable and outstanding research, applied or fundamental, in the following disciplines: (1) Physical sciences; (2) Chemical sciences; (3) Biological sciences; (4) Mathematical sciences; (5) Engineering sciences; (6) Medical sciences; and (7) Other sciences.

To decide about the prizes, the Council invites and accepts nominations each year from the presidents of approved scientific societies of all-India character, vice chancellors of universities, deans of science, engineering & technology, and medical faculties, directors of IITs, deans of faculties and heads of institutions deemed to be of university status, director general of major R & D organizations, such as DRDO, ICAR, ICMR, chairmen of AEC, UGC, Space Commission, ONGC, etc., directors of CSIR laboratories and BARC, TIFR, etc., and the Bhatnagar Prize awardees. University faculties should recommend persons working in their institutions only and route their nominations through their respective vice chancellors while the faculties in IITs should send their nominations through their directors. The directors of CSIR laboratories can nominate a candidate in the discipline of their interest, irrespective of whether he/she is working in CSIR laboratories or outside. Each Bhatnagar Prize awardee can send the nomination of one person for each year's award in

his own discipline only. Each such nomination shall give detailed statement of work and attainments of the nominee, and a critical assessment report (not more than 500 words) bringing out the importance of the significant research and development contributions of the nominee made during 5 years preceding the year of the prize. Nominations from individuals sponsoring their own names or of others are not accepted.

Nominations may be sent (by registered post) along with ten copies of detailed statements of work and attainments of each nominee and the discipline under which the nominee is to be considered. The attainments of the nominee during the past 5 years may be highlighted, and sent along with at least one set of reprints of papers published during the 5-year period. The nominations signed by the sponsors should be sent in a sealed cover marked 'confidential' to the Head, Extra-Mural Research, CSIR, Rafi Marg, New Delhi 110001, and should reach CSIR latest by 31 March 1979.

The regulations governing the prize and the proforma for nomination may also be obtained from the Head, Extra-Mural Research, CSIR.

Leather Week and Tanners' Get-together: CLRI

The Central Leather Research Institute (CLRI), Madras, will organize its 'Leather Week' from 31 January to 6 February 1979 and the fourteenth Tanners' Get-together from 1 to 3 February 1979. The topic for discussion at the get-together will be 'Economics of Indian Leather and Leatherware Industries'. The participants will be able to present their problems pertaining to the industry and trade and financial institutions, and to suggest workable solutions. Enquiries relating to the get-together may be made to the Conveners, Fourteenth Tanners' Get-together 1979, Central Leather Research Institute, Adyar, Madras 600020.

